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ABSTRACTS OF CHEMICAL PAPERS PUBLISHED IN BRITISH AND FOREIGN JOURNALS.

PART II.

General and Physical Chemistry.

Critical Pressure of Luminescence of Gases. Alexandre de Hemptinne (*Bull. Acad. Roy. Belg.*, 1903, 851—863. Compare Abstr., 1902, ii, 58; 1903, ii, 193, 199).—The term "critical pressure of luminescence" is used synonymously with the term "Umkehrdruck" employed by Ebert (*Ann. Phys. Chem.*, 1899, [ii], 69, 372), and refers to that limiting pressure of a gas, the increase or decrease of which equally leads to greater electric resistance. The author has studied especially the influence of a magnetic field on the value of this "critical pressure," using for this purpose a Tesla coil, terminating in two metallic plates, 20 cm. long and 7 cm. broad, between which the tubes containing the gas and connected to a McLeod gauge were placed. This arrangement eliminates the error due to change of distance between the electrodes observed by Ebert (*loc. cit.*). The "critical pressure" in a tube 6·5 cm. long and 1 cm. in diameter depends, under these conditions, on the positions of the tube relatively to those of the metallic plates, being greatest when the tube is vertical and parallel to the plates, and least when it is placed lengthwise and perpendicular to them. Under the additional influence of a magnetic field, the "critical pressure" is reduced in the former position (parallel to the lines of force) and increased in the second (perpendicular to the lines of force). The author explains these effects induced by the magnetic field by assuming that the movement of each electrified particle of gas is then a resultant of its inherent movement as an electrified particle and that due to the magnetic field. This changes the range of movement of the particles in the first position of the tube from the diameter of the tube to a range intermediate between this and the whole length of the tube, and in the second position decreases the range of movement from that of the whole length of the tube to a range intermediate between this and the diameter of the tube. In conformity with this explanation, it was observed that no change in the "critical pressure of luminescence" occurs in a magnetic field when the gas is contained in a spherical vessel. T. A. H.

Luminous Effects at Electrodes and a New Spectroscopic Method. WERNER VON BOLTON (*Zeit. Elektrochem.*, 1903, 9, 913—922). —When a metallic rod connected with a current source giving an *E.M.F.* of 110 volts is dipped slowly into a quantity of sulphuric acid (1 : 20) or nitric acid (1 : 4) into which an anode connected with the positive pole of the source of current has already been placed, the end of the rod gives off a brilliant light which, when examined in the spectroscope, shows the lines of the metal employed together with the hydrogen spectrum.

The metallic spectra are also obtained when platinum wires are employed and a small quantity of a salt of the metal is added to the electrolyte, the best results being obtained with nitric acid. A carbon rod gives a continuous spectrum. At the anode, a very faint light is observed, the spectrum of which is mainly continuous. The metallic spectra observed at the cathode appear to be due to the vaporisation of the metals as they are deposited; the cathode is always surrounded by a film of hydrogen, through which the current passes in the form of minute sparks. The method is very sensitive; a solution of 1 mg. of strontium nitrate in 3 litres of water, for example, shows the strontium spectrum distinctly. Charts are given showing the spectra observed. T. E.

Relationship between Spectra and Atomic Weights. CARL RUNGE (*Phil. Mag.*, 1903, [vi], 6, 698—701. Compare Abstr., 1903, ii, 346).—An adverse criticism of Watts' method (Abstr., 1903, ii, 654) of calculating the atomic weight of radium from its spectrum. J. C. P.

Absorption of Ultra-violet Rays in Ozone. EDGAR MEYER (*Ann. Physik.*, 1903, [iv], 12, 849—859).—The author has determined the value of the absorption coefficient over the range $\lambda = 185\mu\mu$ to $\lambda = 300\mu\mu$, and finds a minimum value at $\lambda = 205\mu\mu$, and a maximum at $\lambda = 258\mu\mu$. The latter agrees with the position ($\lambda = 256\mu\mu$) of the absorption band given by Hartley (Trans., 1881, 39, 60, 111).

The sun's spectrum comes more or less suddenly to an end at $\lambda = 293\mu\mu$, and the absorption of the solar radiation in the earth's atmosphere, which is responsible for that fact, is, according to Hartley, due to the ozone. Taking into account the percentage of ozone in the atmosphere and the values of the absorption coefficient obtained by himself, the author regards Hartley's view as probably correct.

J. C. P.

Spectra of Neon, Krypton, and Xenon. EDWARD C. C. BALY (*Phil. Trans.*, 1903, *A*, **202**, 183—242).—The gases were in all cases illuminated by the passage of an electric discharge through them under reduced pressure. The heating of the electrodes in presence of these monatomic gases is much more marked than in ordinary circumstances, and this heating effect is very troublesome in view of the large amount of hydrogen evolved from the electrode and the consequent masking of the spectrum to be investigated. The phenomenon of electrical evaporation, common enough with platinum and similar electrodes, has been observed for the first time with aluminium electrodes.

The spectra of the gases consist of bright, well-defined lines similar to those of argon and helium, the definition depending, however, on the pressure in the vacuum tube. If the pressure is not less than a certain small value, the appearance of the spectrum becomes confused, and at times it is almost continuous. The spectrum of neon consists of very bright lines in the orange and red regions, and its character is not materially altered by the introduction into the circuit of a Leyden jar and spark gap. Krypton and xenon, on the other hand, are like argon in possessing first and second spectra, according as (1) the direct discharge is passed, or (2) a Leyden jar and spark gap are introduced into the circuit. The first spectrum of krypton consists of a few lines, the most important being the yellow and green lines and a group of blue lines. The second spectrum of krypton is characterised by a considerable number of lines, chiefly in the blue. The first spectrum of xenon exhibits a group of blue lines less refrangible than the group in the first krypton spectrum. The second xenon spectrum is even more complex than the second krypton spectrum, and is characterised by certain bright green lines which determine the colour of the discharge. The wave-lengths of all the lines observed are given in the paper and compared, where possible, with the data of other observers (Runge, *Astrophys. Journ.*, 1899, **10**, 73; Liveing and Dewar, Abstr., 1901, ii, 213, 598).

J. C. P.

Ultra-violet Spectrum of Radium. Sir WILLIAM CROOKES (*Proc. Roy. Soc.*, 1903, **72**, 295—304, 413).—An induction spark was passed between platinum poles partly immersed in a strong solution of pure radium nitrate, slightly acidified with nitric acid. The position of the various lines was determined by comparison with an iron spectrum. Tables are given showing the wave-lengths, not only of the lines detected by the author, but also of those ascribed to radium by earlier investigators. Many of the latter lines were probably due to something else than radium and are not found in the author's list.

J. C. P.

Further Observations on the Spectrum of the Spontaneous Luminous Radiation of Radium at Ordinary Temperatures. Sir WILLIAM and Lady HUGGINS (*Proc. Roy. Soc.*, 1903, **72**, 409—413).—The glow spectrum of radium bromide is found to coincide with the band spectrum of nitrogen. It appears, therefore, that the radium stimulation is unable to elicit from either the radium or the bromine molecules their characteristic line spectra. J. C. P.

Absorption of Light by Aqueous Solutions of Copper and Nickel Salts. E. MÜLLER (*Ann. Physik*, 1903, [iv], **12**, 767—786).—The absorption within the limits of the visible spectrum is the same for all the copper salts investigated so long as the solutions are dilute. In concentrated solutions of cupric bromide and chloride, there is a further absorption in the blue and the violet; in concentrated solutions of the nitrate and acetate, there is a further absorption in the red. The molecular extinction coefficient (Beer's law) approaches a limiting value with increasing dilution, and this value is the same for all copper salts, in agreement with the theories of Knoblauch and Ostwald.

Concentrated solutions of nickel salts have very different tints, but in dilute solutions there is uniformity as in the case of the copper salts.

The colour of those salt solutions for which Beer's law is fulfilled within the limits of the visible spectrum is independent of the temperature. The fact that Beer's law is not valid for other solutions is doubtless to be attributed to the dissociation. J. C. P.

Influence of Great Dilution on the Absorption Spectra of Highly Concentrated Solutions of the Nitrates and Chlorides of Didymium and Erbium. JOHN EDWARD PURVIS (*Proc. Camb. Phil. Soc.*, 1903, **12**, 206—211).—The absorption bands of very concentrated solutions of didymium and erbium chlorides are not affected by dilution. Those of concentrated solutions of the nitrates become less diffuse on dilution. The absorption bands of concentrated and dilute solutions of didymium and erbium chlorides correspond very closely with those observed in dilute solutions of the nitrates.

J. C. P.

Colour-sensitive Silver Chloride. EMIL BAUR (*Zeit. physikal. Chem.*, 1903, **45**, 613—626).—It is found that all photochlorides (that is, mixtures of silver chloride and subchloride in different proportions) reproduce the solar spectrum in its proper colours, and it is considered probable that the various coloured modifications of the subchloride behave as optical antipodes. Evidence is brought forward also to show that silver chloride and subchloride most probably form homogeneous mixtures. J. C. P.

Polarimetric Researches. II. Rotation Dispersion in Solutions. CHR. WINTHER (*Zeit. physikal. Chem.*, 1903, **45**, 331—377. Compare Abstr., 1902, ii, 589).—In order to find how far the rational dispersion coefficient (*loc. cit.*) retains the same value for various solutions of an optically active substance, the author has extended his investigations to solutions of ethyl tartrate in benzene and *iso*butyl alcohol, and of propyl tartrate in benzene, *iso*butyl alcohol, and ethylene bromide. It is found that the rational dispersion coefficient is the same for all substances in the tartaric acid group, whether they are in the pure state or in solution. Equations are given connecting the specific rotation and the temperature for various solutions, and it is seen that the maximum temperatures in these equations are in the main independent alike of the wavelength of the light and the concentration of the solutions. The mean values of these maximum temperatures for all the substances of the tartaric acid group lie between 137° and 149°. In the case of substances exhibiting anomalous dispersion, a given change of rotation always involves a corresponding regular change of dispersion, whether this change is brought about by an alteration of temperature or an alteration of concentration. It is further shown that the influence of the solvent on the dispersion is in the main constant and independent of the concentration. This fact finds expression in the calculation of a solution dispersion coefficient—a constant which varies with the nature of the solvent and the active solute. J. C. P.

Phenomena of Luminosity and their Possible Correlation with Radioactivity. Henry E. Armstrong and T. Martin Lowry (*Proc. Roy. Soc.*, 1903, 72, 258—264).—One of the authors has previously pointed out (Abstr., 1902, ii, 546) that luminous manifestations may be attributed to oscillatory changes in molecular structure. This argument is developed, and it is shown that the occurrence of triboluminescence runs more or less parallel with the existence of isodynamic forms. Menthyl phenylformylacetate, which exists in two such forms, not only is triboluminescent, but gives out brilliant flashes of light as it separates from solution. Crystals of saccharin, unless highly purified, give off flashes of light when crushed, and this substance may be conceived as existing in two isodynamic forms. In neither of the above cases could any effect on the electrometer be detected. Another fact of importance is that triboluminescence is observed in the case of π-bromonitrocamphor, camphoroxime, and α-bromocamphor, which can all exist in isodynamic forms, whilst it is not observed in similar cases where isodynamic forms are impossible, for example, α-chloro-α-bromocamphor.

The phenomena of fluorescence and phosphorescence are discussed also from the point of view of isodynamic change, and it is suggested that radioactivity may be regarded as an exaggerated form of fluorescence in which radiations generally capable of penetrating substances are absorbed and rendered obvious. Thorium and thorium X may be regarded as merely isodynamic forms of thorium, behaving very similarly to the isodynamic forms of nitrocamphor. It is pointed out that the properties referred to in this paper are common to many substances. Uranium nitrate is not only radioactive, but triboluminescent, fluorescent, and phosphorescent at low temperatures. Platinocyanides are triboluminescent, fluorescent, and phosphorescent at low temperatures. It is possible, therefore, that these several luminous manifestations may have a common origin in isodynamic change. J. C. P.

Penetrating Radiation from the Earth's Surface. H. Lester Cooke (*Phil. Mag.*, 1903, [vi], 6, 403—411).—With a gold leaf electroscope, it is shown that there ordinarily exists everywhere a radiation comparable as regards penetrating power with that from radium. This radiation accounts for 30—33 per cent. of the natural ionisation commonly observed in testing vessels, a conclusion deduced from the reduction of ionisation effected by using massive lead screens. The penetrating radiation may be due to the radioactive matter which is distributed throughout the earth and the atmosphere.

A number of materials, such as brick, dried earth, polished tin, writing paper, stone, pine-wood, lead, zinc, and iron were found on examination to emit a radiation of a not very penetrating character, a phenomenon which probably accounts for the residual ionisation in an electroscope surrounded by heavy metal screens; this activity was found to be less for brass than for any of the materials just mentioned.

With the author's arrangement of the testing apparatus, it is found that the number of ions produced per c.c. per second in air under atmospheric pressure is 5 (compare the number 14, found by C. T. R. Wilson). J. C. P.

The Scintillating Phosphorescence which Certain Substances present under the Action of the Radium Rays. Henri Becquerel (*Compt. rend.*, 1903, 137, 629—634).—In view of the explanation of the scintillating phosphorescence of the spinthariscope offered by Crookes (Abstr., 1903, ii, 461), the author has completed a series of experiments started some years ago (Abstr., 1900, ii, 126), with the object of ascertaining (1) whether a part only of the radium rays is concerned in the phenomenon, and (2) whether the scintillations are really due to the impact of the electrons on the screen, or if they are not rather to be attributed to a change in the molecular structure of the material composing the screen induced by the action of the exciting rays.

In order to investigate the first point, thin mica screens coated with various phosphorescent materials in a fine state of division were exposed to the rays emitted by a small quantity of radium chloride, and preliminary experiments, in which a thin sheet of aluminium was placed between the radium chloride and the screen, showed that the scintillating phosphorescence was excited by those rays which are most readily absorbed and consequently least penetrating.

In another series of experiments, the separate effects of the α- and β-rays on the screens were examined by placing the radium chloride in a lead block between the poles of an electromagnet, and the results obtained confirmed Crookes' opinion that the α-rays only induce the scintillating phosphorescence; the phosphorescence excited by the β-rays, if appreciable or preponderating, masks the phenomenon produced by the α-rays.

The question whether the scintillations are to be attributed to the impact of the electrons on the screen or to the molecular disintegration of the material forming the screen is not so easily solved; but evidence in favour of the latter alternative is afforded by the fact that the state of aggregation of the material composing the screen plays a very important part in the phenomenon. When a relatively large crystalline fragment of hexagonal blende is exposed to radium rays, it becomes phosphorescent, but shows no scintillations; if the same crystal is broken into very small pieces, it exhibits under the same conditions variable brilliant points of light, whilst if it is pulverised the characteristic scintillations appear. A similar luminous effect is produced when the crystals are broken mechanically between plates of glass (compare Armstrong and Lowry, this vol., ii, 5). M. A. W.

Scintillation of Phosphorescent Zinc Sulphide in the presence of Radium, Revived by Electric Discharges. THOMAS TOMMASINA (*Compt. rend.*, 1903, **137**, 745—747).—Screens of zinc sulphide which have been exposed to the action of radium rays and then kept in the dark for some time exhibit phosphorescence, but no scintillation. The phosphorescence of a screen which has been covered with a glass plate is distributed equally over the surface, whilst an unprotected screen exhibits several dark points and a single bright one. The scintillations on each screen can be revived, but to an unequal extent, by the action of positive or negative electric discharges, the unprotected screen still exhibiting the dark points, but the scintillations being as bright as those initially produced by the radium rays. The dark points correspond with cavities in the crystalline layer, and the scintillations are most vivid at the more prominent edges of the crystals. These facts point to an electrostatic origin of the light phenomenon, which consists in the irregular production of discharges resulting in the cleavage of the crystal (compare Becquerel, preceding abstract). M. A. W.

Heat given out by Radium. CARL RUNGE and J. PRECHT (*Sitzungsber. K. Akad. Wiss. Berlin*, 1903, 783—786).—To estimate the heat given out by radium, the authors have determined the current which must be supplied to a small platinum spiral so that the latter shall, under the same conditions, produce the same temperature difference as the radium salt. They find, in good agreement with Curie and Laborde (Abstr., 1903, ii, 346), that one gram of radium gives out 105 cal. per hour. From an experiment similar to the foregoing, in which the radium salt was enclosed in a leaden cell, the authors conclude that the kinetic energy of the particles shot off from radium constitutes only a small part (probably less than 5 per cent.) of the total heat developed. Hence, on the assumption that the particles shot off from radium move with not less than a tenth of the velocity of light, it is shown that one gram of radium would in 1000 years lose less than one-half of a milligram in weight.

If it is assumed that the heat given off from a radium salt is dependent only on the amount of radium it contains, a comparison of the amounts of heat evolved from equal quantities of the chloride and bromide furnishes a method of calculating the atomic weight of radium. J. C. P.

Activity Induced by Thorium. F. von Lerch (*Ann. Physik*, 1903, [iv], 12, 745—766).—The decline of the activity induced on metals by the emanation from thorium follows in all cases the same exponential law (compare Rutherford and Soddy, Trans., 1902, 81, 841). If the metals are dissolved, the activity becomes associated with the ions, and if the metal is precipitated as an insoluble compound, the precipitate is active. If the induced activity on a piece of metal is dissolved by treatment for several minutes with hot dilute hydrochloric acid, and the active solution thus obtained is electrolysed between inactive platinum electrodes, the cathode becomes intensely active, the anode remains inactive. When amalgamated zinc is used as cathode, the same result is obtained, and the activity falls off in the same manner as the ordinary induced activity. The rate of decline of the activity is somewhat greater with a platinum cathode. It is possible to obtain the activity at the other electrode if silver is used as anode and the chlorine is fixed as silver chloride; if the active silver chloride thus obtained is reduced by zinc in presence of hydrochloric acid, part of the activity is transferred to the zinc.

The author's experiments favour the view that the solution of the activity from metal plates by hydrochloric acid is electrolytic in character. Copper, tin, lead, nickel, iron, cadmium, zinc, magnesium, and aluminium immersed in such an active solution, become active; platinum, palladium, and silver remain inactive. The activity thus deposited falls off at a rate which varies in different cases, and from this the author draws conclusions as to its composition. The chief portion, the decline of which corresponds with that of the ordinary induced activity, is assigned a place in the potential series between copper and lead, close to hydrogen.

The results obtained indicate generally that the activity induced by thorium is of a material character. J. C. P.

Change of Electrical Resistance of Selenium under the Influence of Certain Substances. Arthur B. Griffiths (*Compt. rend.*, 1903, 137, 647).—When a piece of selenium was exposed at a distance of 5 cm. from an alcoholic solution of the pigment from geranium petals for about 15 minutes, its electrical resistance, determined by the Wheatstone bridge method, fell from 462,000 ohms to 320,000 ohms. Similar results were obtained with other vegetable and animal pigments. As van Aubel (Abstr., 1903, ii, 403) has already shown that a reduction in the electrical resistance of selenium is effected by light, radium, and Röntgen rays, the author suggests that the pigments emit these rays. M. A. W.

Conditions determining the Sign and Magnitude of "Contact" Electrification. Jean Perrin (*Compt. rend.*, 1903, 137, 513—514).—The author has investigated the sign and magnitude of the electrification produced by contact of a solid with a liquid by observing the movement (*electric osmose*) induced in the same liquid by an electric charge equal in amount and opposite in kind, and finds that the charge resulting from contact is generally greatest with liquids of high ionising capacity (such as water), and is due to the ions present in the liquid. In aqueous solutions, the ions +H and −HO alone are active, and each of these charges the diaphragm (that is, the immersed solid) with electricity of its own sign. This method of detecting free +H and −HO ions is more delicate than that of coloured indicators such as litmus.

The activities of +H and −HO ions are diminished by the presence respectively of negative and positive polyvalent ions, and the magnitude of this paralysing action increases with the concentration of the polyvalent ions.

In conformity with these views are the statements of (*a*) Picton and Linder, that colloids probably exist in aqueous solution in the form of electrically charged granules; (*b*) of Hardy, that the sign of this charge is extremely sensitive to the influence of traces of acids and alkalis, and (*c*) of Schulze and of Hardy, that the coagulation of colloids is brought about most readily by electrolytes capable of furnishing a polyvalent ion carrying a charge opposite in sign to that of the colloidal granules, and is the more effective the greater the charge of this ion (compare Abstr., 1903, ii, 469). T. A. H.

Electromotive Forces resulting from the Contact and Reciprocal Action of Two Liquids. MARCELLIN P. E. BERTHELOT, (*Compt. rend.*, 1903, **137**, 956—957. Compare Abstr., 1903, ii, 526, 626).—The author's former papers have shown the importance of utilising electrically the chemical energy developed by reactions between solutions. C. H. D.

Reproduction of the Electromotive Forces of some Strong Oxidising Agents. J. SCOBAI (*Zeit. Elektrochem.*, 1903, **9**, 879—887). —It has been frequently observed that the difference of potential between a platinum electrode and a solution of an oxidising agent is affected by the acidity of the latter, but the values of the potential differences are so variable and uncertain that no definite connection between them can be found.

The author has experimented with $1N$, $12N$, and $22N$, and anhydrous sulphuric acids saturated with manganese dioxide, potassium permanganate, chromium trioxide, and sodium persulphate, and with different varieties of platinum and iridium electrodes. He finds that, after a few days, the potential differences attain constant values, which are, as a rule, independent of the electrode used. With chromic acid, the potentials fall a little on shaking, but soon regain their original values. For the concentrated solutions used, it appears, therefore, that the potential differences measured are really constant and reproducible quantities. T. E.

Electrical Conductivity of Flames. FERNAND VANDEN BOSSCHE (*Bull. Acad. Roy. Belg.*, 1903, 864—887. Compare Hemptinne, Abstr., 1902, ii, 119).—The author confirms the statement of Smithells, Dawson, and Wilson (Abstr., 1899, ii, 722), that the electrical conductivity of a flame containing a vaporised metallic salt is not dependent on the dissociation of the salt by water vapour in the flame and subsequent ionisation of the metallic hydroxide produced, as was suggested by Arrhenius (Abstr., 1891, 515).

The author has investigated the phenomenon of unipolar conduction shown by flames containing vaporised salts, and finds that the extent to which this phenomenon is exhibited is dependent on the nature of the metal and appears to have some relationship to the valency of the latter, being most marked in the case of univalent metals such as sodium and potassium.

Unipolar conduction is also shown by a flame containing finely-divided metallic platinum, but not by flames containing bromine or chlorine. The unipolar conductivities of flames containing salts of univalent elements increases with the concentration of the salt solution injected, but this effect is less marked in the case of salts of bivalent metals. On the other hand, the effect of a change in the voltage of the current is much greater with flames containing salts of bivalent metals than with those containing salts of univalent elements.

The author points out that the statement of Wilson (Abstr., 1899, ii, 723), that unipolar conduction of flames containing vaporised salts is the result of the difference in the velocities of the positive and negative ions into which the salt is dissociated, leads to the conclusion that flames containing salts of barium and strontium should show more marked unipolar conduction than those containing potassium and sodium salts, which is in opposition to the experimental results now brought forward. He explains the differences exhibited in this respect by salts of univalent and bivalent metals by assuming that ionisation of the salts occurs only where the gas is in contact with the electrodes, and principally at the negative electrode, which, it is further assumed, exerts a greater ionising influence on salts of univalent elements than on those of bivalent elements, and that, consequently, there is a greater flow of electricity from the negative electrode in the former case. This would also explain the greater effect induced by change of voltage in the case of salts of the bivalent metals. T. A. H.

Conductivity of Mixtures of Electrolytes. FERDINAND BARMWATER (*Zeit. physikal. Chem.*, 1903, 45, 557—565. Compare Abstr., 1899, ii, 396).—The author deduces an expression for the conductivity of binary mixtures of organic acids, and the theoretical deductions are tested by experiments on mixtures of acetic acid with glycollic, propionic, butyric, or valeric acid; of propionic acid with butyric or valeric acid; and of butyric acid with valeric acid. The agreement is exceedingly good for mixtures of acetic and glycollic acids, and least satisfactory for mixtures of acetic and valeric acids. J. C. P.

Can the Formation of Complexes be Deduced from the Electrolytic Conductivity of Mixtures of Acids? ROBERT HOFMANN (*Zeit. physikal. Chem.*, 1903, 45, 584—588).—The author shows that whilst the laws of isohydric solutions apply in the case of (1) hydrochloric and sulphuric acids, (2) chromic and sulphuric acids, they do not apply in the case of chromic and hydrochloric acids, the conductivity of a mixed solution of the last two acids being markedly different from the calculated value. The conclusion to be drawn is that these two form complexes in solution, the existence of which tendency is already known. J. C. P.

History of the Electrolysis of Water. ALBERT NEUBURGER (*Ber.*, 1903, 36, 3572—3574).—The discovery that hydrogen and oxygen are the only products of the electrolysis of water and that the production of alkali at the cathode and acid at the anode is due to impurity in the water is usually credited to Davy, who commenced his experiments in 1800, but did not publish this result until 1806. This fact had been observed by P. L. Simon, and was published in *Gilbert's Annalen*, 1801, 8, 41 and 492; 9, 386, five years before Davy's communication appeared. T. M. L.

Complex Ions of Zinc and Cadmium. HANS EULER (*Ber.*, 1903, 36, 3400—3406. Compare Abstr., 1903, ii, 544).—The solubility of zinc hydroxide in ammonia solutions of different concentration increases much more rapidly than the concentration of the ammonia.

It has not been found possible to calculate the dissociation constant K for the zinc-ammonia complex from the equation

$$K = 4D[NH_3]_4/[Zn(NH_3)_4]_3,$$

where D denotes the ionisation product, $\overset{++}{Zn} \times (\overset{-}{OH})_2$.

The values for K calculated from the $E.M.F.$ of concentration cells, metal | hydroxide in ammonia | $0{\cdot}05N$ sulphate | metal, were as follows: for Zn, $K = 2{\cdot}6 \times 10^{-10}$, and for Cd, $K = 1{\cdot}0 \times 10^{-7}$. The zinc-ammonia complex, $\overset{++}{Zn}(NH_3)_4$, is thus some 100 times as stable as the cadmium-ammonia complex, $\overset{++}{Cd}(NH_3)_4$.

For the anions $\overset{--}{Zn}(CN)_4$ and $\overset{--}{Cd}(CN)_4$, the following values have been obtained for K, by a similar method, namely, $1{\cdot}3 \times 10^{-17}$ and $1{\cdot}4 \times 10^{-17}$.

Abegg's theory of valency is adversely criticised. J. J. S.

New Method for the Determination of Freezing Points of Fused Electrolytes. OTTO LIEBKNECHT and ERLING NILSEN (*Ber.*, 1903, 36, 3718—3721).—The freezing point of a fused electrolyte may be accurately determined by measurements of the electrical conductivity, by Kohlrausch's method, at short intervals (every 5° or 10° of temperature). The freezing point is indicated by a sudden change in the direction of the curve. Carbon electrodes give a sharper minimum than metal. The temperature is determined by a thermo-couple. For high conductivities, a three-limbed tube of hard glass is suitable, the electrodes being plunged into the outer limbs and the thermo-element in the centre limb. Curves are given for several mixtures of commercial salts. The freezing point of a mixture of potassium chloride and sodium fluoride is identical with that of a mixture of sodium chloride and potassium fluoride. C. H. D.

Heats of Combustion of Organic Compounds viewed as Additive Properties. Alcohols, Phenols, Ethers, Aldehydes, and Ketones. Paul Lemoult (*Compt. rend.*, 1903, **137**, 515—517. Compare Abstr., 1903, ii, 410).—By assigning the values 51, 130, and 210 Cal. to the influences exerted respectively by single, double, and triple linkings of carbon to carbon, on the molecular heats of combustion of hydrocarbons, and of 53 Cal. to that due to carbon linked to hydrogen, the author has shown that the mol. heats of combustion of a number of hydrocarbons can be calculated (*loc. cit.*). This investigation has now been extended to the classes of oxygenated carbon compounds enumerated in the title by the use of further suitable conventional values.

For primary and secondary saturated alcohols, the influence of the group ⁝C·OH = 8 Cal.; for phenols and saturated tertiary alcohols, this is diminished to 2 Cal., and for unsaturated alcohols it becomes − 4 Cal. The influence of the group ⁝C·O·C⁝ in saturated ethers is estimated at 18 Cal., and for unsaturated ethers at 6 Cal. In saturated aldehydes, the effect of the carbonyl group is 12 Cal., and in saturated ketones, 6 Cal., these values being in each case diminished by 12 Cal. in the case of the unsaturated compounds.

The mol. heats of combustion of a number of compounds calculated in this way are given in the original, and shown to agree with those determined experimentally. T. A. H.

Calculation of the Heats of Combustion of Organic Acids, their Anhydrides and Esters. Paul Lemoult (*Compt. rend.*, 1903, **137**, 656—658).—The author finds that the heats of combustion of saturated organic acids, their anhydrides and esters, like those of the hydrocarbons, alcohols, ethers, aldehydes, and ketones (Abstr., 1903, ii, 410; preceding abstract), is a linear function of the number of carbon atoms in the molecule, the relation being represented by the general equation $\gamma = 157x + A$, where γ is the heat of combustion, x the number of carbon atoms in the molecule, and A a constant the value of which depends on the nature of the compound. For monocarboxylic acids, $A = -106$; for dicarboxylic acids -212; and for esters -90. Similar conventions are given for the calculation of the heat of combustion of corresponding derivatives of the aromatic series and the unsaturated aliphatic series. M. A. W.

A New Method for the Calculation of Heats of Combustion and some of its Consequences. Paul Lemoult (*Compt. rend.*, 1903, **137**, 979—982. Compare Abstr., 1903, ii, 410).—The molecular heat of combustion of any hydrocarbon C_xH_y containing only single linkings is given by $(102x + 27{\cdot}5y)$ Cal., trimethylene being an exception. For hydrocarbons containing one double linking, this is increased by 28 Cal., and for one triple linking by 57 Cal. Compounds containing oxygen have their heat of combustion diminished by a quantity ϕ, which has a separate value for each function, the value for a compound $C_xH_yO_p$ becoming $(102x + 27{\cdot}5y - \Sigma p\phi + K)$ Cal. The values of ϕ and K are tabulated for a number of different classes of compounds. The value of K for a quadruple linking, such as would exist in a molecule C_2, may be obtained by extrapolation. C. H. D.

The Temperature of Flames. Charles Féry (*Compt. rend.*, 1903, **137**, 909—912).—The author has devised a method of measuring the temperature of flames which does not involve the introduction of a solid body into the flame, but depends on the principle that when the light rays emitted by a luminous body pass through a monochromatic flame, the bright lines characteristic of the spectrum of the latter disappear (are reversed) when the temperature of the luminous body becomes the same as that of the flame. The luminous body employed was the filament of an incandescent lamp, and the temperature was determined by means of the absorption pyrometer used in the determination of the temperature of the electric arc (*Compt. rend.*, 1902, **134**, 1201); the flames under investigation were rendered monochromatic by means of sodium or lithium salts, and the following results were obtained :

Bunsen burner, Air holes open	1871°	(mean of 8 determinations, limits 1855° and 1895°)
„ „ half open	1812	
„ „ closed	1712	
Acetylene flame	2548	
Alcohol, free flame	1705	
Vapour of alcohol burning in a Bunsen burner	1862	
Same lamp (alcohol mixed with 50 per cent. of benzene)	2053	
Hydrogen burning freely in air	1900	
Blow-pipe (coal gas and oxygen)	2200	
„ (hydrogen and oxygen)	2420	

M. A. W.

Measurement of the Pressure Coefficient of Oxygen at Constant Volume and Different Initial Pressures. Walter Makower and Henry R. Noble (*Proc. Roy. Soc.*, 1903, **72**, 379—385).—The authors have determined, with the apparatus previously used by Travers and Jaquerod (Abstr., 1903, ii, 9), the coefficient of increase of pressure for oxygen between 0° and 100°, the initial pressures being 375 and 700 mm. The value of the coefficient found increases slightly with the initial pressure, and on linear extrapolation to zero initial pressure lies between 0·003664 and 0·003665.

The thermodynamical correction at 0° is calculated for oxygen, and with this correction the authors find $\theta_0 = 273{\cdot}09$, where θ_0 is zero temperature on the thermodynamic scale. This value is in good agreement with that found by Callendar for air, nitrogen, and hydrogen (see *Phil. Mag.*, 1903, [vi], **5**, 48). J. C. P.

Vapour Pressures of Liquid Oxygen on the Scale of the Constant Volume Oxygen Thermometer filled at different Initial Pressures. Morris W. Travers and Charles J. Fox (*Proc. Roy. Soc.*, 1903, **72**, 386—391. Compare Travers, Senter, and Jaquerod, Abstr., 1903, ii, 9).—Using the apparatus previously described (*loc. cit.*) and taking the value of the pressure coefficient of oxygen found by Makower and Noble (preceding abstract), the authors show that the temperatures on the oxygen scale at which liquid oxygen has certain vapour pressures are lower than the corresponding temperatures on the helium scale. The deviation varies with the initial pressure in the oxygen thermometer, and is found on linear extrapolation of the observed values to be 1·5° at 1000 mm. initial pressure and 0·4° at zero initial pressure. J. C. P.

Determination of Vapour Densities at High Temperatures. FRIEDRICH EMICH (*Monatsh.*, 1903, **24**, 747—764).—The author describes the application of Bunsen's method to the determination of vapour densities at temperatures between 1400—1900°. The apparatus consists of a cylindrical vessel, maintained at a constant temperature by a water jacket, from which the gas is driven over into a heated tube, terminating in the small opening through which the gas escapes. The opening, the shape of which is of some importance, may be in the centre of the tube. The temperatures of the vessel and of the tube must be kept constant, but the latter need not be known, in which case the apparatus is standardised with a gas known not to dissociate at the temperature of experiment. As the mercury rises in the vessel, it closes two electrical circuits, which, in conjunction with a second pendulum, gives the rate of flow of the gas. More constant results are obtained with porcelain than with platinum or iridium tubes. G. Y.

The Elasmometer, a New Interferential Form of Elasticity Apparatus. ALFRED E. H. TUTTON (*Phil. Trans.*, 1903, *A*, **202**, 143—163).—An improved apparatus for determining the coefficient of elasticity of crystals. J. C. P.

Diffusion and Supersaturation in Gelatin. HARRY W. MORSE and GEORGE W. PIERCE (*Zeit. physikal. Chem.*, 1903, **45**, 589—607).—It has been shown by Liesegang that when the end of a capillary tube containing a gelatin solution of potassium chromate is dipped in a solution of silver nitrate, the silver chromate precipitated by the diffusion of the silver nitrate is not equally distributed, but is concentrated in laminæ at right angles to the axis of the tube. Ostwald considers this to be a supersaturation phenomenon, and supposes that precipitation occurs when the limit between the metastable and labile conditions has been crossed. The authors have now made a theoretical and quantitative experimental study of the precipitation of silver chromate under the above-mentioned conditions, and found the numerical value of H, the constant metastable concentration product —a quantity analogous to the solubility product for two ions in presence of the solid electrolyte. H is defined by the equation $[Ag^{\cdot}]^2[CrO_4'']=H$, and determines the limit of supersaturation for silver chromate when the solid phase is absent. The value found for H is $1{\cdot}4\times10^{-6}$, and this means that the concentration of silver chromate in the gelatin when precipitation begins is 145 times as great as that required for saturation in presence of the solid.

In the course of their work, the authors have shown that the distance between the laminæ of silver chromate in any given tube, at a given temperature, and for given concentrations of the reacting substances is governed by the relationship $x / \sqrt{t} =$ const., where x is the distance from the end of the tube of a lamina formed t seconds from the time of dipping in the silver nitrate. The time of formation of a lamina could be exactly determined, for it took place suddenly.

The value found for the diffusion constant of silver nitrate in gelatin containing silver chromate is 1·54.

Liesegang observed a similar formation of laminæ in the cases of mercurous chromate, lead chromate, and Prussian blue, and the authors have obtained the same result with lead sulphate, silver carbonate, phosphate, bromide and thiocyanate, cobalt hydroxide, barium chromate, and mercurous bromide. J. C. P.

Course of the Solubility Curve in the Region of Critical Temperatures of Binary Mixtures. ANDREAS SMITS (*Proc. K. Akad. Wetensch. Amsterdam*, 1903, 6, 171—181).—The course of a solubility curve of a solid in the region of critical temperatures is discussed. Experiments were made with ether and anthraquinone, which were introduced into a tube at −80° and then sealed up. The temperature was then observed at which all the anthraquinone dissolved. When the mixture consists of 45 per cent. of ether and 55 per cent. of anthraquinone, below 195° there is excess of solid anthraquinone together with a saturated solution and vapour. At about 195°, the first critical temperature is reached, when, if more heat be added, the solution disappears and the phases consist of solid anthraquinone and vapour. At 241°, the liquid phase is regenerated, and, on further rise of temperature, more anthraquinone gradually dissolves, until at 247° it has all dissolved. With further increase of temperature, the region of unsaturated solution is reached, until at 350° the unsaturated solution has reached its critical temperature, and all passes into the gaseous state.

It was also shown with ether and anthraquinone that points in the metastable part of the critical curve could be determined. Vapours can be supersaturated towards the solid phase, and for their transition into the stable phase pass through the metastable phase, namely, a supersaturated solution.

The results of Walden and Centnerszwer (Abstr., 1903, ii, 284) on the solubility of potassium iodide in liquid sulphur dioxide are discussed. A. McK.

Solubility of Ammonia in Salt Solutions, as Measured by its Partial Pressure. II. HANS RIESENFELD (*Zeit. physikal. Chem.*, 1903, 45, 461—464. Compare Abstr., 1902, ii, 309).—A number of determinations, carried out as described in the earlier paper, have been made at 35°. The values thus obtained for the lowering of the solubility have been compared with the values previously obtained at 25° and with the values determined at 60° by Konowaloff. The only solutions for which a marked temperature coefficient exists are those of sodium and potassium carbonates, sodium and lithium chlorides, In these cases, presumably, there is interaction between the ammonia and the dissolved salt. For sodium hydroxide, potassium hydroxide, chloride, nitrate, acetate and oxalate, the temperature coefficient is practically zero. It appears from the above that where there is interaction between ammonia and the dissolved salt, it is greater for sodium than for potassium salts, and greater for lithium than for sodium salts. J. C. P.

Condition of Sodium Sulphate in Solution. CHARLES MARIE and R. MARQUIS (*Zeit. physikal. Chem.*, 1903, **45**, 566—570).—According to Wyrouboff (Abstr., 1901, ii, 149), a solution of sodium sulphate prepared from the hydrated salt contains hydrated molecules, and is not the same as one prepared from the anhydrous salt. If this were so, the solubility of sodium chloride in a solution of hydrated sodium sulphate should exhibit a sudden increase at the temperature of transition of the decahydrate. The authors, whose experiments have been made at temperatures between 14·8° and 34·3°, find no trace of any such discontinuity (compare also Hantzsch, Abstr., 1903, ii, 145). J. C. P.

Velocity of Decomposition of Ammonium Nitrite. II. KURT ARNDT (*Zeit. physikal. Chem.*, 1903, **45**, 571—583. Compare Abstr., 1902, ii, 64).—A consideration of detailed points raised by Blanchard's paper (Abstr., 1903, ii, 18). In particular, the author argues against Blanchard's view that the velocity of decomposition increases with the concentration of the NO_2' ions, for it can be shown that the presence of potassium nitrite has no effect. The accelerating effect of other nitrites, such as those of sodium and barium, is probably due to their hydrolytic dissociation and the consequent formation of nitrous acid (compare Arndt, *loc. cit.*). The author estimates that in $0·3N$ solution, sodium nitrite is hydrolytically dissociated to the extent of 0·1 per cent., barium nitrite to the extent of 0·32 per cent.

The affinity constant of nitrous acid has been determined, and the value found to be very slightly different from that obtained by Schumann (see Blanchard, *loc. cit.*). J. C. P.

The Laws of Displacement of Chemical Equilibrium. E. ARIÈS (*Compt. rend.*, 1903, **137**, 738—741. Compare Abstr., 1903, ii, 589). From purely mathematical considerations, the author deduces the relation $dvdp - dsdT < 0$, where dv and ds denote respectively the variation of volume and entropy due to chemical action in a system. By making $dT = 0$ or $dp = 0$, the relation becomes the mathematical expression of the two laws of the displacement of chemical equilibrium due to Le Chatelier and van't Hoff, namely, (i) at constant temperature, the chemical change produced by an increase of pressure involves a contraction of volume. (ii) At constant pressure, the chemical change produced by increase of temperature is endothermic. M. A. W.

Exceptions to the Phase Rule, especially in the Case of Optically Active Substances. ALFRED BYK (*Zeit. physikal. Chem.*, 1903, **45**, 465—495).—In his lecture on the phase rule, van't Hoff pointed out that it was possible to construct out of the two components,

H_2O and $NaClO_3$, a system containing five phases, namely, vapour, solution, inactive salt, and the two active forms, that is, one more than the phase rule allows. Van't Hoff concluded that the phase rule should be supplemented by the introduction of molecular conceptions, and Wegscheider (Abstr., 1903, ii, 356) adopted a similar view of the insufficiency of the phase rule. In the present theoretical paper, which is in general unsuitable for abstraction, the author shows that thermodynamical treatment gives a perfectly adequate interpretation of the observed phenomena, even in the case of optically active substances. It is only necessary to modify somewhat the definition of a 'phase' commonly given in thermodynamical text-books. J. C. P.

Conception of Independent Components. II. RUDOLF WEGSCHEIDER (*Zeit. physikal. Chem.*, 1903, **45**, 496—504).—A reply to van Laar's criticisms (Abstr., 1903, ii, 536). J. C. P.

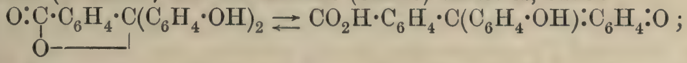
Theories of Indicators. JULIUS STIEGLITZ (*J. Amer. Chem. Soc.*, 1903, **25**, 1112—1127).—The "chromophoric" theory of indicators is preferred by the author to the "ionisation" theory. The explanation, for instance, that phenolphthalein should become intensely red by forming an ion without a chromophoric group appeared, from the outset, as extremely unlikely. It is more probable that phenolphthalein in its colourless solution has the constitution of a lactone, whilst its salts are derivatives of a carboxylic acid and not of a phenol and have the constitution

$$O{:}C_6H_4{:}C(C_6H_4\cdot OH)\cdot C_6H_4\cdot CO_2M,$$

with the strongly chromophoric quinonoid complex ${:}C_6H_4{:}O$. The sodium salt is incidentally ionised; this ionisation is a coincidence and not a cause, since the solid, dry, non-ionised silver salt is also intensely coloured.

Methyl-orange is taken as a type of an amphoteric indicator. In alkaline solution, it is probable that metallic salts of methyl-orange, $SO_3H\cdot C_6H_4\cdot N{:}N\cdot C_6H_4\cdot NMe_2$, containing the azo-grouping, are produced, whilst in acid solution red salts of methyl-orange, $\underline{SO_3\cdot C_6H_4\cdot NH\cdot N{:}C_6H_4{:}NMe_2}$, of the quinonoid constitution, are formed. [Compare also Vaillant, this vol., i, 119.]

In an aqueous solution of phenolphthalein, it is supposed by the author that a condition of equilibrium is established between the quinonoid (unstable) and the lactonic (stable) varieties, thus:

(1) 

$$O{:}\underset{\underset{O\text{———}}{|}}{C}\cdot C_6H_4\cdot \underset{|}{C}(C_6H_4\cdot OH)_2 \rightleftharpoons CO_2H\cdot C_6H_4\cdot C(C_6H_4\cdot OH){:}C_6H_4{:}O;$$

the condition of equilibrium favours the lactonic form, since the solution is colourless and only traces of the quinonoid acid can be present; this trace of acid is in equilibrium with its ions, thus:

$$(2)\ O{:}C_6H_4{:}C(C_6H_4\cdot OH)\cdot C_6H_4\cdot CO\cdot OH \rightleftharpoons O{:}C_6H_4{:}C(C_6H_4\cdot OH)\cdot C_6H_4\cdot CO\cdot O' + H^{\cdot}.$$

The addition of alkali causes the disappearance of the hydrogen ions, when more of the quinonoid molecules must be ionised in order that the equilibrium may be preserved; the quinonoid form must in turn be reproduced from the lactonic according to equation (1). The effect of alkali, therefore, is to suppress the colourless lactonic isomeride by converting the unstable free quinonoid acid into its stable quinonoid salt, which is coloured red and is incidentally ionised.

The author adduces experimental evidence on the part of Hantzsch and others in support of his views.

The sensitiveness of indicators is also discussed. A. McK.

Theory of Colloids and Suspensions. Jean Billitzer (*Zeit. physikal. Chem.*, 1903, **45**, 307—330).—The author discusses the theories brought forward by Hardy and by Bredig, and finds them inadequate. According to Hardy, the addition of an electrolyte to a colloidal solution diminishes the potential difference between the colloid particles and the surrounding liquid, the point at which the potential difference vanishes being termed the "isoelectric" point. But it is pointed out that colloidal platinum, which under ordinary conditions travels towards the anode, can be made to travel in the opposite direction by the addition of alcohol, which, however, precipitates the colloid only very slowly. On the other hand, the addition of potassium chloride, which does not diminish the potential difference between the colloid and the liquid, precipitates the platinum in a few minutes. The author himself avoids the electrical double layer theory, and conceives the colloidal solution as containing charged particles of the colloid, which may be positive or negative, and may be outside the immediate sphere of action of the oppositely charged particles of the water. When an electrolyte is added, the charged particles of the colloid collect round the positive or negative ion as a nucleus, and, when heavy enough, the accumulated matter is precipitated. In support of this view, the author refers to the observation (compare Linder and Picton, Trans., 1895, **67**, 63; Spring, *Arch. Sci. phys. nat.*, [iv], **10**, 305; Whitney and Ober, Abstr., 1902, ii, 65) that the ion effective in the precipitation is oppositely charged to the colloid. Further, it is shown by experiments with the chlorides of barium, strontium, calcium, and potassium that the quantities of these various metals carried down by the precipitated colloid are in the ratio of their chemical equivalents. If potassium chloride is used as the precipitating electrolyte, acid is set free when the colloidal substance is electronegative, whilst alkali is liberated when the colloidal substance is electropositive.

Emphasis is laid on the complete analogy between regular colloidal substances and mechanical suspensions. J. C. P.

Classification of Colloids. Arthur Müller (*Zeit. anorg. Chem.*, 1903, **36**, 340—345).—The author submits the following classification of colloids: (1) suspensions of fine particles, (*a*) where the medium is water or a liquid of less viscosity, (*b*) where the medium is a liquid of higher viscosity, for instance, colloidal silver chloride in gelatin solution (de Bruyn). (2) Solutions of compounds with high molecular weights. A. McK.

Absorption Compounds of Hydrogel. Jacobus M. van Bemmelen (*Zeit. anorg. Chem.*, 1903, **36**, 380—402. Compare Abstr., 1902, ii, 70).—The criteria of "absorption compounds" are as follows. The quantities absorbed are related in no equivalent proportion to the absorbing quantities; the composition depends on the structure of the absorbing substance and varies with the temperature. The composition also varies with the concentration of the surrounding vapour phase. The rate of formation of an absorption compound decreases as the absorption increases.

By dialysis of ferric chloride and sodium silicate respectively, the hydrosols of ferric oxide and silicon dioxide were prepared. The observations of Kohlrausch on the conductivity of sodium silicate solutions are interpreted on the supposition that sodium hydroxide and silicon dioxide hydrosol are gradually formed on the gradual dilution of a concentrated sodium silicate solution.

A small quantity of baryta suffices to convert ferric oxide sol into the hydrogel; baryta is absorbed by the latter, and equilibrium is established after some time. The quantities of baryta absorbed varied with different hydrosol preparations; the absorption is at first rapid. Barium chloride is also absorbed by the hydrogel.

From the ferric oxide hydrosol, strong acids separate a hydrogel, which, however, gradually dissolves.

Experiments with silicon dioxide hydrosol and baryta are also quoted. A small quantity of baryta converts the hydrosol into the hydrogel, by which baryta is also absorbed. When molecular proportions of silicon dioxide and barium hydroxide are taken, the crystalline barium silicate, $BaSiO_3,6H_2O$, separates. Crystallographic measurements of the latter are quoted. A. McK.

Colloidal Metals. Jean Billitzer (*Chem. Centr.*, 1903, ii, 982; from *Verh. Vers. Deutsch. Naturf. Aerzte*, 1902, 19—21. Compare Abstr., 1902, ii, 454).—The addition of a certain amount of alcohol to an aqueous solution of colloidal platinum does not cause the colloid to move either to the anode or cathode, hence no potential difference is established. On the other hand, less colloid is precipitated by the alcohol than by an indifferent electrolyte. In the solution of an electrolyte, the positively charged colloidal or suspended particles attract the anions and condense on their surfaces, whilst the negatively charged particles behave in a similar manner towards the cathions. Marble suspended in a solution of barium chloride, for instance, becomes positively charged and attracts the negative ion, thus leaving the solution alkaline, whilst powdered porcelain, under similar conditions, is negatively electrified and adheres to the positive ion, thus rendering the solution acid. Aggregation of the small particles in colloidal solutions in non-conducting liquids involves loss of free energy, but the consequent decrease of electrical capacity tends to raise the potential and to increase the free energy, hence the process of cohesion cannot take place spontaneously. Since the colloidal particles in solutions of electrolytes are rendered electrically neutral by the action of the ions, there is no increase of potential. In the case of suspended particles, the force of gravitation also comes into play.

E. W. W.

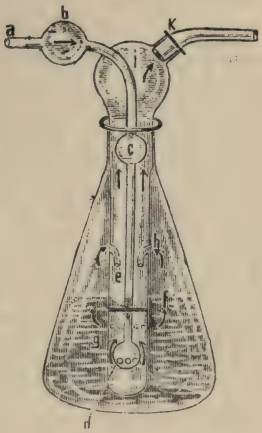
Fifth Report of the Atomic Weight Commission. Hans Landolt and Wilhelm Ostwald (*Ber.*, 1903, **36**, 3759—3766).—A reply to Winkler (*Chem. Zeit.*, 1903, **76**, 918), who urges the readoption of H = 1 as the standard of atomic weights and protests against the insertion of H = 1·01 in the international table of atomic weights in place of H = 1·0076, the value given by E. W. Morley in 1890; the latter alteration corresponds with an alteration of Ag 107·93 to 108·18. In reply, it is pointed out that if H = 1 be adopted as the standard, an alteration in the ratio H : O from 15·88 to 15·87 would introduce a change in the atomic weights of other elements, which in the case of chlorine is four times, in the case of iodine eleven times, and in the case of mercury fifteen times as great as the probable error in the determination of the ratio Cl : O, I : O and Hg : O; on the other hand, with O = 16, the change in the atomic weight of hydrogen would only be from 1·0076 to 1·0082. It is further pointed out that the use of H = 1·01 in place of 1·008 introduces an error of less than 0·02 in the percentage composition of the majority of hydrogen compounds.

T. M. L.

Production of High Vacua for Chemical Distillation. Ernst Erdmann (*Ber.*, 1903, **36**, 3456—3461).—High vacua can readily be produced by filling a distilling apparatus with carbon dioxide under reduced pressure and cooling a part of the apparatus with liquid air. If rubber stoppers are eliminated, the vacuum of the cathode light can be produced; an apparatus with rubber connections gave a minimum pressure of 0·026 mm. Liquid carbon dioxide cannot be used, as it contains 0·75 vol. per cent. of air dissolved in it; the proportion of oxygen in this absorbed air is 24·1 per cent. Carbon dioxide snow gave good results, but the simplest arrangement is to prepare the gas from marble and hydrochloric acid, and, before condensing with liquid air, to exhaust to 30 mm. with a water pump; the apparatus is filled with carbon dioxide and exhausted three times in order to free it from air; merely passing the gas through the apparatus is not sufficient to displace the air in a reasonable time. The following examples are given: *o*-nitrobenzoyl chloride, b. p. 105° under 0·5 mm. pressure, m. p. of distillate, 20°; glycerol, b. p. 115—116° under 0·056 mm. pressure; 1 : 2-naphthylene diamine, b. p. 150—151° under 0·48 mm. pressure; *p*-aminodiphenylamine, b. p. 155° under 0·026 mm. pressure.

T. M. L.

Triple Acting Wash and Absorption Bottle. C. Glatzel (*Chem. Zeit.*, 1903, **27**, 1060—1061).—The apparatus consists of the inlet tube, *a*, with two bulbs, *b* and *c*, to prevent the regurgitation of the liquid, and a third bulb, *d*, the lower portion of which is provided with very small openings. The inlet tube is sealed into a cylinder, *e*, which is ground air-tight into the bottle, and at *f* passes through a partition. At *g*, the cylinder contains a ring of small holes, and at *h* two tubes have been sealed. The bulb, *i*, is used for the reception of dry absorbers, which are introduced by means of the tube, *k*. The bottle is filled up to the mark with the absorbing liquid, and, as will be seen from the

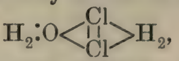


figure, this stands, of course, higher in the narrow inlet tube, *a*, than in the wider cylinder, *e*. When gases are passed through, the liquid is expelled from the inlet tube and is forced into the surrounding cylinder, so that the small openings at *d* are always immersed in the liquid, even when there is a great pressure. The gas comes in a finely-divided state in contact with the liquid, is washed or absorbed, escapes through the openings, *g*, of the cylinder, and then passes again in a finely divided state through the liquid surrounding the cylinder into the empty space of the bottle Thence it passes through the tubes *h* into the upper part of the ground cylinder, the bulb of which is filled with a dry absorber. Instead of this, a second liquid may also be used, which is poured through the tube *k* into the separate compartment of the cylinder to such a height that the tubes *h* are immersed. L. DE K.

Inorganic Chemistry.

Combination of Hydrogen and Chlorine under the Influence of Light. P. V. BEVAN (*Phil. Trans.*, 1903, *A*, 202, 71—121).—In addition to the work already described (see Abstr., 1902, ii, 237), the author has made a number of experiments bearing on the induction period. It is found that the induction period may be prolonged indefinitely, although its general character remains the same. If the chlorine has been illuminated before it is mixed with the hydrogen, the subsequent action of light on the mixture is more rapid to begin with, in other words, the induction period is shortened. This effect of previous illumination of the chlorine is destroyed by bubbling the chlorine through water. Previous illumination of the hydrogen has no effect on the period of induction. With Wilson's expansion method (*Proc. Camb. Phil. Soc.*, 9, 333), it has been shown that the formation of hydrogen chloride is preceded by the production of an intermediate substance, which can act as a condensation nucleus. The removal of this substance by expansion and consequent precipitation stops the production of hydrogen chloride, and the induction period has to begin over again. The observation that the combination of hydrogen and chlorine is much accelerated by the presence of water vapour, together with experiments just described, lead the author to assume the intermediate formation of a compound of chlorine and water, perhaps $\mathrm{H_2{:}O{<}\begin{smallmatrix}Cl\\ |\\ Cl\end{smallmatrix}}$.

To this, a molecule of hydrogen may attach itself, forming



$$H_2{:}O<\begin{array}{c}Cl\\ |\\ Cl\end{array}>H_2,$$

which finally breaks down into $H_2O + 2HCl$. This view, which in its general lines may be extended to other chemical reactions where the presence of water is necessary, explains the phenomena of the induction period and the effect of pre-insolation of the chlorine, and interprets also the observation that small quantities of impurities very markedly diminish the rate of action. In all gaseous reactions which are conditioned by the presence of a catalyst, a period of induction must be expected to occur, and the application of the mass action law to these cases must be made with reference to the intermediate compounds formed. It is not to be expected, therefore, that the law of mass action as applied to the end product equation will interpret the actual experimental results (compare, on this whole subject, Mellor, Trans., 1901, 79, 216; 1902, 81, 1280, 1292). J. C. P.

Electrolytic Formation of Perchlorate. WILHELM OECHSLI (*Zeit. Elektrochem.*, 1903, 9, 807—828).—The oxidation of a chlorate to a perchlorate differs from the oxidation of an iodate to a periodate in the circumstance that the former is accompanied by a loss of free energy, whilst the latter is not. When the oxidation is carried out electrolytically, there are corresponding differences, the best yield of perchlorate being obtained with high current density at smooth platinum anodes, at low temperatures, and in neutral or acid solutions, whereas the yield of periodate is best at low current densities, and is little affected by temperature or by the acidity or alkalinity of the solution. The last-named characteristics are found in most cases of simple oxidation. The facts just mentioned, which the author has confirmed by means of a large number of electrolyses of solutions of chlorates, are best explained by the hypothesis that the formation of perchlorate is not due to a simple oxidation but takes place as follows: the ClO_3 group liberated primarily at the anode reacts with water giving oxygen and chloric acid. The highly concentrated solution of chloric acid so formed then decomposes spontaneously into perchloric and chlorous acids, the latter being then oxidised by the anodic oxygen to chloric acid. The process may be represented by the equations $2ClO_3' + H_2O + 2F = HClO_4 + HClO_2 + O$, and $HClO_2 + O = HClO_3$. The latter reaction is shown to take place by electrolysing solutions of chlorine dioxide and of alkali chorites. Ozone is liberated at the anode when perchlorate is being produced, but the author finds by direct experiment that ozone is incapable of oxidising a solution of a chlorate; the formation of ozone has, therefore, nothing to do with the formation of perchlorate. T. E.

New Method for the Preparation of Pure Iodine. LAUNCELOT W. ANDREWS (*Amer. Chem. J.*, 1903, 30, 428—430).—The following method is described for the preparation of pure iodine from impure potassium iodide. The potassium iodide is powdered with 1·4 times its weight of potassium dichromate, each salt having been previously fused to ensure perfect dryness. The mixture is introduced into a wide tube and heated at 200° in a current of dry air to expel the last traces of moisture. A plug of dry glass wool is placed over the mixture, which is then heated with a small flame. The iodine having been sublimed into the upper part of the tube, the latter, when cold, is cut off at a point 2—3 cm. above the glass wool plug. E. G.

Preparation of Pure Iodine. Henri Baubigny and Paul Rivals (*Compt. rend.*, 1903, **137**, 927—929).—See this vol., ii, 81.

Derivation of Organic Polyvalent Iodine Compounds from Existing or Hypothetical Inorganic Iodine Compounds. Conrad Willgerodt (*Chem. Zeit.*, 1903, **27**, 1132—1134. Compare Abstr., 1903, i, 745, 746).—This paper contains an enumeration of various organic compounds, which may be regarded as derivatives of iodine trichloride, iodine trifluoride, the hypothetical iodin, IH_3, the hypothetical hydroxyiodin, $IH_2{\cdot}OH$, the hypothetical acid, $O{:}I{\cdot}OH$, di-iodin, $H_2I{\cdot}IH_2$, iodine pentafluoride, iodine oxyfluoride, IOF_3, iodic acid, the hypothetical periodic acid, $IO_3{\cdot}OH$, trihydroxyperiodic acid, $IO_2(OH)_3$, chloric acid, bromic acid, and perchloric acid. A. McK.

Atomic Weight of Fluorine. Julius Meyer (*Zeit. anorg. Chem.*, 1903, **36**, 313—324).—The results obtained by Davy, Berzelius, Louyet, Dumas, de Luca, Fremy, Moissan, and Christensen for the atomic weight of fluorine show considerable discrepancies. The author has accordingly studied the interaction of calcium oxide and hydrofluoric acid.

Ammonium carbonate, carefully purified by sublimation, was added to an aqueous solution of calcium nitrate and the precipitated calcium carbonate converted into oxide by heating it in a platinum crucible by means of an electric oven (compare Hinrichsen, Abstr., 1902, ii, 137, 501). The calcium oxide was converted into calcium hydroxide, which was next converted into calcium chloride; by repeated evaporation of this with hydrofluoric acid, the fluoride was finally obtained. As a mean of five determinations, the value found was 19·036, with a probable error of $\pm 0{\cdot}00149$ ($Ca = 40{\cdot}136$), a number slightly less than Moissan's. A. McK.

The Extraction of Oxygen by the Partial Liquefaction of Air with Reflux Action. Georges Claude (*Compt. rend.*, 1903, **137**, 783—786).—When air cooled to $-160°$ is allowed to rise under a pressure of two atmospheres through vertical metal tubes kept in a bath of liquid air, it is partially liquefied, the liquid being slightly richer in oxygen than the ordinary air (compare *Compt. rend.*, 1903, **136**, 1659—1662), is therefore in equilibrium with a gaseous phase less rich in oxygen than itself; the liquid falls in the tube and meets a gaseous phase of different composition, and equilibrium is restored by an exchange of nitrogen on the part of the liquid phase for oxygen from the gaseous phase; this process is repeated throughout the downward passage of the liquefied air until the final product may contain as much as 50 per cent. of oxygen.

By diminishing the pressure of the gas undergoing liquefaction, the condensation is less rapid, and the resulting liquid becomes richer in oxygen and the residual gas richer in nitrogen; thus, under a pressure of 0·7 atmosphere, one-third only of the air was liquefied, the final liquid phase contained 70 per cent. of oxygen, and the final gaseous phase 97—98 per cent. of nitrogen. An apparatus on a large scale, arranged by the Soc. de l'*Air liquide*, supplies 30—40 cubic metres per hour of liquid air containing 92 per cent. of oxygen. M. A. W.

Ozone. LEOPOLD GRÄFENBERG (*Zeit. anorg. Chem.*, 1903, 36, 355—379. Compare Abstr., 1902, ii, 449).—The amount of ozone in the oxygen evolved in the electrolysis of hydrofluoric acid increases with the current density, but is not proportional to it. At the temperature of the laboratory, the yield of ozone did not exceed 5·2 per cent. of the amount theoretically obtainable from the direct action of fluorine on water. The anodes were destroyed during the electrolysis.

The oxidation potential of ozone was determined. The *E.M.F.* of 10 per cent. ozone in potassium hydroxide gave 1·65 volt.

A new theory for the formation of ozone is formulated.

The existence of ozonic acid, H_2O_4, is regarded as possible.

A. McK.

Influence of the Electrolyte and the Electrodes on Ozone Formation. ROBERT KREMANN (*Zeit. anorg. Chem.*, 1903, 36, 403—411. Compare Luther and Inglis, Abstr., 1903, ii, 406; Gräfenberg, preceding abstract).—With 2 volts, the author was unable to detect ozone in the electrolysis of sulphuric, chromic, and phosphoric acids. With equal potential and equal current density, the yield of ozone was greater in those cases where the surface of the anode was small. Experiments were made with sulphuric, phosphoric, and chromic acids, where the anodes consisted of platinum, nickel, gold, and lead peroxide.

In sulphuric acid solution, the formation of ozone proceeds more readily with lead peroxide than with platinum. When the concentration of the acid is about 4 mols. per litre, the yield of ozone reaches its optimum. With increase of surface of the anode, the influence of concentration of the various acids used disappears. All the electrodes employed appear to decompose the ozone formed. Sulphuric acid was the most favourable electrolyte with the various electrodes; lead peroxide is best for phosphoric acid and platinum for chromic acid solutions. Ozone is formed from potassium hydroxide at low temperatures only. A. McK.

Ozonising of Oxygen by the Silent Electric Discharge. E. WARBURG (*Sitzungsber. K. Akad. Wiss. Berlin*, 1903, 1011—1015. Compare following abstract).—The silent electric discharge took place from a metallic point kept at a constant measured potential between 4000 and 12,000 volts, and the amount of ozone produced was compared with the quantity of electricity passing through the gas. The ozone produced was always under 1 per cent. of the maximum amount that could be obtained in the apparatus.

When the potential is negative, the quantity of ozone per coulomb is for a given current independent (1) of the potential difference of the electrodes, and (2) of the character of the earthed electrode. The quantity of ozone per coulomb decreases slowly as the current increases. When the potential is positive, the quantity of ozone per coulomb increases rapidly with the current; for small currents, its value is less than with negative potential, for larger currents it is greater. The work expended in the production of 1 gram of ozone by the above method is calculated for the most favourable case, and found to be about 34 times as great as the equivalent of the heat absorbed in the formation of 1 gram of ozone. For the production of 1 gram equivalent of ozone, not more than 500 coulombs are required, and it is therefore improbable that the process involved in the production of ozone by the silent electric discharge is at all similar to electrolysis. The author considers that the production of ozone by the silent electric discharge may be attributed to photo- and cathodo-chemical action.

J. C. P.

Production of Ozone by the Silent Electric Discharge in Siemens' Ozone Apparatus. Arthur W. Gray (*Sitzungsber. K. Akad. Wiss. Berlin*, 1903, 1016—1020. Compare preceding abstract).—The quantity of ozone per coulomb produced in the author's apparatus is 0·27 gram, a value 4—5·5 times greater than that obtained by Warburg, using a point discharge. The ozone per coulomb is independent of the potential difference between the electrodes of the generator, and probably also of the quantity of electricity used.

J. C. P.

Temperature of Ignition and Slow Combustion of Sulphur in Oxygen and in Air. Henri Moissan (*Compt. rend.*, 1903, **137**, 547—553).—The method employed for carbon (Abstr., 1903, ii, 141) gave results for the ignition point of octahedral sulphur varying between 275° and 280°; it was modified by maintaining the sulphur in an atmosphere of carbon dioxide and heating the oxygen by allowing it to bubble through the fused sulphur. Below 282°, sulphur dioxide was formed without any incandescence; when this temperature was reached, the reaction became more vigorous, a slight explosion occurred, followed immediately by incandescence. The ignition point of sulphur in air was found to be 363°; this is raised by the presence of 5 per cent. of sulphur dioxide to 445°, and when 10 per cent. is present, ignition does not occur at 465°. The point of ignition of sulphur vapour in air is much lower than that of liquid sulphur, being about 285° (compare, however, Hill, Abstr., 1890, ii, 849).

The slow combustion of sulphur in oxygen in sealed tubes, at temperatures below 150°, was studied by cooling the gaseous products in liquid air; it was found that, even at 20°, after the lapse of a month, the production of sulphur dioxide could be detected in this way.

Similar results were obtained with prismatic and amorphous sulphur; the action is much slower in air, but traces of sulphur dioxide could be detected at the end of three months when the temperature was maintained at 16—26°.

M. A. W.

Radioactivity and Atomic Weight of Tellurium. GIOVANNI PELLINI (*Gazzetta*, 1903, **33**, ii, 35—42).—The author suggests that the explanation of the fact that tellurium gives a higher atomic weight than iodine, and so makes these elements occupy abnormal positions in the periodic system of the elements, is due to the presence in the tellurium of a small quantity of an element which has a higher atomic weight (about 212), is similar to tellurium, and analogous to the radioactive constituents of pitch-blende (compare Marckwald, Abstr., 1903, ii, 81). T. H. P.

Dimorphism of Telluric Acid. B. GOSSNER (*Zeit. Kryst. Min.*, 1903, **38**, 499—501).—Telluric acid, $Te(OH)_6$, crystallises in two modifications, a cubic (sp. gr. 3·053) and a monoclinic (sp. gr. 3·071); detailed crystallographic descriptions are given of each. The latter, although pseudo-rhombohedral in habit, is not hexagonal as previously described (Abstr., 1896, ii, 97; 1901, ii, 649). L. J. S.

Orthonitric Acid. HUGO ERDMANN (*Zeit. angew. Chem.*, 1903, **16**, 1001—1004).—The author has submitted experimental evidence for the existence of orthonitric acid, $N(OH)_5$ (Abstr., 1903, ii, 73). Küster (*ibid.*, 939) denies the existence of this compound on what the author considers as very scanty experimental evidence. Küster further claims to have isolated the hydrates HNO_3,H_2O and $HNO_3,3H_2O$. These substances were discovered not by Küster but by Pickering (Trans., 1893, **63**, 436). A. McK.

Hydrates of Nitric Acid. FRIEDRICH W. KÜSTER (*Zeit. angew. Chem.*, 1903, **16**, 1079—1080).—Polemical. A reply to Erdmann (compare preceding abstract). A. McK.

Metaphosphates. FRIEDRICH WARSCHAUER (*Zeit. anorg. Chem.*, 1903, **36**, 137—200).—An historical review of the chemistry of metaphosphates is first given.

Copper metaphosphate, $(CuP_2O_6)_n$, prepared by adding copper oxide to an excess of about 5 per cent. of crystallised phosphoric acid at a temperature not exceeding about 448°, is indefinite as to crystalline form. It is decomposed with difficulty by hydrogen sulphide, and, when the resulting solution is neutralised by sodium hydroxide, sodium metaphosphate, $(Na_2P_2O_6)_n,2nH_2O$, is formed. Barium metaphosphate was prepared from barium carbonate and phosphoric acid. Aluminium metaphosphate crystallises from water in tetrahedra. Lead metaphosphate is prepared from phosphoric acid and lead oxide at a temperature not exceeding 400°. Determinations of electrical conductivity and transport numbers, made with the sodium salt, prepared by the double decomposition of copper metaphosphate and sodium sulphide, indicated that this sodium salt has the composition $Na_4P_4O_{12},4H_2O$. Potassium metaphosphate loses its water of crystallisation at 100°; determinations of its electrical conductivity pointed to its having the composition $K_4P_4O_{12},2H_2O$. The ammonium salt of the composition $(NH_4)_4P_4O_{12}$ (deduced from the conductivity determinations quoted) is anhydrous; its crystals, which are tetragonal, were measured. The lithium salt, $Li_4P_4O_{12},4H_2O$, is sparingly soluble in water, and in this respect differs from lithium ortho- and pyrophosphates. The silver salt is anhydrous.

When the lead salt, prepared at a temperature below 400°, interacts with sodium sulphide, the resulting sodium salt is identical with the salt prepared from copper metaphosphate and sodium sulphide. A different lead salt is formed when the temperature of formation exceeds 400°, and, when this substance is decomposed by sodium sulphide, it forms a sodium salt, which, from the conductivity measurements quoted, appears to be sodium hexametaphosphate.

A quantitative separation of pyrophosphate from metaphosphate cannot be accomplished by Fremy's luteocobaltichloride. A. McK.

Action of Carbon Dioxide under pressure on the Metallic Phosphates. A. Barillé (*Compt. rend.*, 1903, **137**, 566—568).—The author finds that the metallic phosphates may be divided into two classes with respect to their behaviour towards carbon dioxide under pressure in the presence of water: (1) those which, like calcium phosphate (Abstr., 1902, ii, 258), combine with the carbon dioxide to form a soluble carbophosphate, and (2) those which simply dissolve in the carbonic acid without undergoing any decomposition. The metals, the phosphates of which belong to the first class, are those of the alkalis and the alkaline earths (sodium, potassium, ammonium, calcium, barium, and magnesium), which are capable of forming hydrogen carbonates; the normal phosphates of these metals appear to form a [tribasic] carbophosphate of the type

$$(M_2'HPO_4)_2,2CO_2,2(M'HCO_3),$$

which decomposes in the presence of air forming the monohydrogen phosphate and hydrogen carbonate of the metal; whilst the monohydrogen phosphates give a [dibasic] carbophosphate of the type $(M_2'HPO_4)_2,2CO_2$, which, on decomposition, regenerates the original salt. M. A. W.

Sublimed Carbon. Marcellin P. E. Berthelot (*Compt. rend.*, 1903, **137**, 589—594).—The author has examined the sublimate of carbon formed on the inner surfaces of incandescent lamps, using a current of 70—80 volts; under these conditions, the temperature of the carbon filament probably ranges from 1200—1500°. The sublimate dissolved entirely when treated with nitric acid and potassium chlorate, and therefore consisted solely of amorphous carbon. Similar experiments made (*a*) with raw, hydrogen-free carbon filaments, and (*b*) with "used" carbon filaments, from both of which mineral matter had been previously removed by treatment with ammonium fluoride and sulphuric acid, indicated that these also consisted of amorphous carbon. The formation of a sublimate in incandescent lamps under these conditions indicates that carbon exerts an appreciable vapour tension at temperatures about 2000° below its boiling point (3600°). This unusually large interval is regarded as further evidence of the highly complex character of the molecules of solid carbon. T. A. H.

A Filamentous Variety of Carbon. CONSTANT and HENRI PÉLABON (*Compt. rend.*, 1903, **137**, 706—708).—A form of carbon wool is sometimes met with in the upper portions of recuperative coke-ovens, especially at the aperture for the exit of the hot gases. The wool consists chiefly of grey cylindrical threads with glazed surface, sometimes showing a series of expansions, and occasionally bearing bundles of much finer black threads. The average length of the threads is 5 cm., even attaining 8 cm., the diameter varies from 0·03 to 0·15 mm., the black threads being perhaps only 0·002 mm. When heated in dry oxygen, combustion only begins at 585° and is complete, only 0·4 per cent. of ash being found. A mixture of nitric acid and potassium chlorate oxidises the carbon to graphitic acid.

The formation of filamentous carbon is probably due to the decomposition of heavy hydrocarbon vapours by heat. C. H. D.

Artificial Diamonds. RUDOLF VON HASSLINGER and JOSEF WOLF (*Monatsh.*, 1903, **24**, 633—647. Compare Abstr., 1903, ii, 142).—The authors have investigated the effect of variations in the composition of the fusion mixture, and of variations in the rate of cooling after fusion, on the formation of artificial diamonds.

Experiments in which the period of cooling after fusion varied from 10 minutes to 50 hours showed this factor to be without influence on the formation of diamonds or on the size of diamonds formed.

Diamonds are formed in such fusion mixtures only as have a crystalline structure when cooled. The presence of alkalis, calcium and magnesium oxides, and between 45 and 60 per cent. of silica is necessary. A mixture containing a larger proportion of silica does not yield diamonds. The silica may be replaced by titanium dioxide but not by boric acid.

The authors consider that the carbon forms a carbide with a metallic element in the fusion mixture, decomposition of the carbide with liberation of the carbon in the crystalline form follows under favourable conditions.

Diamonds were obtained from a mixture to which carbon had been added only in the form of calcium carbide. G. Y.

[Decomposition of Carbon Monoxide.] Correction. RUDOLF SCHENCK (*Ber.*, 1903, **36**, 3663—3664. Compare Abstr., 1903, ii, 423).—A few corrections of the numbers contained in the previous paper. These do not, however, affect the main deductions already given. J. J. S.

Argon in the Atmosphere. HENRI MOISSAN (*Compt. rend.*, 1903, **137**, 600—606).—The author has repeated the determinations made by Schlœsing (Abstr., 1896, ii, 166, 219) and by Kellas (Abstr., 1896, ii, 661) using, however, as a principal absorbent of oxygen and nitrogen a red-hot mixture of lime and magnesium (Maquenne, Abstr., 1896, ii, 299), and, as a final absorbent, red-hot metallic calcium, which also removes any traces of hydrogen (Abstr., 1899, ii, 25, 155). A large number of samples of air from different parts of the globe, including specimens collected at London, Berlin, and Paris, the summit of Mont Blanc, and on the Atlantic Ocean, were examined. The amounts of argon found in samples of air collected on land at altitudes varying from 0 to 5800 mètres were, as a rule, between 0·932 and 0·935 per cent., and agree with those found by Schlœsing and by Kellas. In the case of those specimens collected over open seas, slightly higher amounts were obtained, reaching 0·9492 per cent. in the case of one specimen collected over the Atlantic Ocean in Lat. 43 N. and Long. 22, 10′W.

T. A. H.

New Preparation of Argon. Henri Moissan and Albert Rigaut (*Compt. rend.*, 1903, **137**, 773—777).—The authors have obtained pure argon from the atmosphere at the rate of 1 litre in 12 hours by taking advantage of the property calcium possesses of forming a crystalline nitride, Ca_3N_2, and hydride, CaH_2, stable at 500°. Atmospheric nitrogen was passed through tubes containing powdered magnesium and quick lime (3 : 5) at a red heat; this increased the quantity of argon to 10 per cent.; a similar operation under diminished pressure was repeated until the final product contained only 5—10 per cent. of nitrogen; this was removed, together with traces of hydrogen, by passing the gas through a tube heated to dull redness and containing crystalline calcium in nickel boats. M. A. W.

Radioactive Gas in Surface Water. H. A. Bumstead and L. P. Wheeler (*Amer. J. Sci.*, 1903, [iv], **16**, 328).—A radioactive gas was obtained from a spring near New Milford, Conn., at a depth of 1500 feet. The water from one of the New Haven city reservoirs (an artifical lake fed entirely by surface drainage) also contained a gas which was strongly radioactive. The gas drawn from the ground, at a depth of about 5 feet, proved to be about three times as radioactive as the gas from the surface water. A. McK.

Electrolysis of Alkali Chlorides. II. Production of Sodium Hydroxide in Diaphragm Electrolysis. Phillipe A. Guye (*Arch. Sci. phys. nat.*, 1903, [iv], **16**, 393—416).—Two methods of procedure are in use in diaphragm electrolysis: (1) the electrolysis is carried on until the cathode liquid has a given alkalinity, when it is entirely withdrawn and replaced by a fresh solution; (2) the cathode solution is maintained at approximately a constant strength, being fed continuously by a salt solution. The first method is that which gives the best yield for the same electrical energy, and the two cases are considered and expressions deduced for concentration after the passage of a definite quantity of electricity. In the second type of electrolysis, two cases are considered: (1) when the feeding solution does not mix with the remainder, (2) when complete mixture is instantaneous. In the first of these, the current yield is equal to that obtained in the previous type of electrolysis. Neither of these cases actually occurs in practice, but the first case approximates to that obtaining when the cathode compartment is large and the current density small; the second is more nearly realised when the cathode compartment is small and the current density is high (compare Abstr., 1903, ii, 586).

L. M. J.

Purification of Brine by Barium Carbonate. GEORGES ARTH and P. FERRY (*Bull. Soc. chim.*, 1903, [iii], 29, 1065—1068).—It has been stated by Kosmann that the sulphates of calcium and magnesium frequently present in natural brines may be eliminated by digestion of the brine with the calculated quantity of barium carbonate, the sulphuric acid being precipitated as barium sulphate and the calcium as carbonate, whilst the magnesium remains in solution. The authors find that the elimination of calcium by this process is fairly complete, but that the sulphuric acid is only completely precipitated by digestion of the brine with three times the calculated quantity of barium carbonate for 3 hours at 100°. Numerical data and curves are given in the original showing the rate of elimination of the acid by digestion of the brine with various proportions of barium carbonate at 10° and 100°, and the amounts of barium carbonate dissolved by brine and also by solutions of (*a*) magnesium chloride and (*b*) of sodium chloride.

T. A. H.

Examination of some Artificially Prepared Compounds. P. VON SUSTSCHINSKY (*Zeit. Kryst. Min.*, 1903, 38, 264—272).—Crystallographic descriptions are given of the following:

Regular octahedral crystals of the alloys $NaCd_2$ and Mg_2Sn, prepared by N. S. Kurnakoff (Abstr., 1900, ii, 277).

Titanite prepared by E. van der Bellen in the manufacture of crystalline glazes on porcelain. Chalk, quartz, and rutile in the proportions required for titanite (CaO,TiO_2,SiO_2) were fused at a temperature of over 1400°. Cavities in the crystalline mass of titanite contained honey-yellow, acicular crystals.

"Copper-glance" from smelting works in the Altai. Bluish-black cubic (not orthorhombic) crystals of cuprous sulphide; they contain 8·93 per cent. of iron, but this may be present as an impurity.

L. J. S.

Relation of Rubidium to Potassium and Cæsium as Illustrated by the Crystalline Forms of Uranyl Double Salts. A. SACHS (*Zeit. Kryst. Min.*, 1903, 38, 496—498).—Potassium uranyl nitrate, $(UO_2)(NO_3)_2,KNO_3$, is orthorhombic, whilst the corresponding rubidium and cæsium salts are rhombohedral and isomorphous. This indicates that a closer relation exists between rubidium and cæsium than between rubidium and potassium. A review of the chemical and crystallographic literature bearing on this point is given.

L. J. S.

Acid Reaction of Ammonium Salts towards Blue Litmus. C. REICHARD (*Chem. Zeit.*, 1903, 27, 1105—1106).—Blue litmus paper, when immersed in aqueous solutions of ammonium chloride varying from 1 to 10 per cent., did not turn red, but when subsequently exposed to the atmosphere reddening took place. A similar observation was made with solutions of ammonium bromide and ammonium oxalate respectively.

A. McK.

Polymorphism of Nitrates. Fréd. Wallerant (*Compt. rend.*, 1903, 137, 805—807).—In addition to the four systems in which ammonium nitrate is known to crystallise, the author finds a fifth and probably a sixth by cooling the monoclinic form to the temperature of solid carbon dioxide; under these conditions, the crystals break down into hemitropic plates which slowly change into homogeneous uniaxial crystals belonging to the rhombohedral system. Cæsium nitrate, which crystallises in the cubic system just below its melting point and becomes rhombohedral on cooling, changes into the cubic system when cooled in liquid air, but the crystals are not isomorphous with the original. M. A. W.

Colours of Allotropic Silver. J. C. Blake (*Amer. J. Sci.*, 1903, [iv], 16, 282—288).—The white, blue, and red forms of silver appear to be sufficiently distinct to be regarded as allotropic forms. Yellow silver is possibly a variety of red silver. The colours in transmitted light are most marked with the colloidal solutions of the various forms of silver, whilst the colours in reflected light can be best noted with the silver mirrors. A table is given, where the appearance of the silver, reduced by different agents from aqueous solution of silver nitrate ammoniacal solution of silver nitrate, ammoniacal solution of silver oxide, suspension of silver oxide in water (filtered after treatment), and aqueous solution of silver nitrate (slightly acidified with sulphuric or nitric acids) respectively, is described. A, McK.

Colloidal Silver. Alfred Lottermoser (*J pr. Chem.*, 1903, [ii], 68, 357—368).—A reply to Hanriot (Abstr., 1903, ii, 597). In preparations of colloidal silver, other colloids are present as impurities and are not essential. Lea's soluble silver contains only traces of impurities. G. Y.

Colloidal Silver Haloids. Alfred Lottermoser (*J. pr. Chem.*, 1903, [ii], 68, 341—343. Compare Abstr., 1898, ii, 116, 514).—Colloidal silver iodide is formed by addition of silver nitrate solution to potassium iodide solution, with or without the presence of ammonia, if the solutions are not stronger than 2 per cent., and the potassium iodide is kept in slight excess. With concentrated solutions or in the presence of ammonium chloride (compare Denigès, Abstr., 1896, ii, 387), the silver iodide is precipitated in the "molecular" state. Colloidal silver iodide is difficult to purify from ammonia by dialysis.

When a solution of silver iodide in potassium iodide is poured into a large excess of water, colloidal silver iodide is not formed, but finely-divided, crystalline silver iodide is precipitated.

Colloidal silver bromide, but not the chloride, is formed under the same conditions as the iodide, but in absence of ammonia. G. Y.

Action of Metals and other Substances on Silver Bromide. Riccardo Bettini (*Nuovo Cimento*, 1903, [v], 5, 349).—The oxidising action exerted by oxidisable metallic laminæ on silver bromide photographic plates has been attributed to the vapours of the metal evolved in very small quantity from the metallic surface. The author shows, however, that such metals, on oxidation, evolve hydrogen peroxide and ozone, which are capable of producing fog or images on bromide plates.

T. H. P.

Formation of Complexes. RICHARD ABEGG (*Ber.*, 1903, **36**, 3684—3687).—A reply to Euler's criticisms (Abstr., 1903, ii, 717) on the author's rule with regard to electro-affinities and the formation of complexes.

J. J. S.

Spontaneous Decomposition of Silver Peroxynitrate. EDUARD MULDER (*Rec. trav. chim.*, 1903, **22**, 385—386. Compare Abstr., 1896, ii, 561; 1897, ii, 260, 551; 1899, ii, 483, and 1900, ii, 724).—On November 28, 1895, the author set aside a specimen of silver peroxynitrate, $3Ag_2O_2,AgNO_3,O_2$, and has since then determined annually its loss of weight (due to evolution of oxygen) during the period ending December 18, 1901. From the tables given in the original, it appears that the average weekly loss of oxygen per gram of the salt varied from 0·000038 gram in the sixth year to 0·000067 in the fourth year. The loss of oxygen is stated to take place from that part of the molecule represented by $AgNO_3,O_2$.

T. A. H.

Electrolysis of an Aqueous Solution of Silver Selenate. EDUARD MULDER (*Rec. trav. chim.*, 1903, **22**, 387).—An electric current was passed for 72 hours through a saturated solution (0·835 gram per litre) of silver selenate in water without effecting any change. This negative result, taken in conjunction with the fact that selenic acid acts as an oxidising agent towards hydrochloric acid, indicates, in the author's opinion, that an acid of the formula H_2SeO_5 cannot exist.

T. A. H.

Action of Hydrogen Peroxide on Silver Oxide, Peroxide, Carbonate, and Nitrate. EDUARD MULDER (*Rec. trav. chim.*, 1903, **22**, 388—400. Compare von Baeyer and Villiger, Abstr., 1901, ii, 315, 654; Berthelot, *ibid.*, 383).—Weighed quantities of the silver compounds were treated with an aqueous solution of hydrogen peroxide, and at the end of the reaction the whole was evaporated to dryness at the atmospheric temperature in a desiccator under reduced pressure and the changes in weight, if any, determined. The results indicated that silver oxide, peroxide, and nitrate were recovered almost quantitatively from this treatment, but that silver carbonate was partially converted into the oxide. The hydrogen peroxide was decomposed in contact with the oxide, peroxide, or carbonate of silver, but not with the nitrate. There was also a slight evolution of oxygen and a small loss of weight when silver peroxynitrate was treated with hydrogen peroxide. The following equations are suggested as explaining typically the catalytic decomposition of hydrogen peroxide by silver compounds: $2(HO{\cdot}OH) + Ag_2O = 2(HO{\cdot}OAg) + H_2O$ $2(HO{\cdot}OAg) = Ag_2O + H_2O + O_2$.

T. A. H.

New Reaction of Silver Peroxide. EDUARD MULDER (*Rec. trav. chim.*, 1903, **22**, 401—404).—Silver peroxide dissolved in sulphuric acid gives a blue coloration with diphenylamine dissolved in the same liquid. The blue coloration produced by the addition of hydrogen peroxide to a solution of diphenylamine in sulphuric acid attains its maximum intensity, in ordinary circumstances, in two hours, then becomes green and finally brown. This brown substance is insoluble in water but dissolves in sulphuric acid giving a bluish-green colour. The blue colour is more stable in the absence of air, and its change to green may be temporarily inhibited by the addition of more sulphuric acid at the point when maximum intensity is reached. If fuming sulphuric acid be employed as a solvent for one or both of the reacting substance, a more permanent violet or bluish-violet coloration is produced. T. A. H.

Structural Formula of the so-called Silver Peroxynitrate. EDUARD MULDER (*Rec. trav. chim.*, 1903, **22**, 405—406. Compare Abstr., 1896, ii, 561 ; 1897, ii, 260, and preceding abstracts ; Sulc, Abstr., 1897, ii, 99, and Tanatar, Abstr., 1902, ii, 73).—The author states that although no compound of fluorine and oxygen has been isolated it is not impossible that Tanatar's compound, $2Ag_3O_4,AgF$, may really have the structure $3Ag_2O_2,AgFO_2$, analogous to that suggested by the author for silver peroxynitrate, $3Ag_2O_2,AgNO_5$, the unstable group, $AgFO_2$, being maintained in equilibrium by the residue of the molecule. Tanatar's formulæ for these compounds are objectionable since they imply the existence of silver oxides of the formulæ Ag_3O_4 and AgO_2, which are, so far, unknown. T. A. H.

Remarkable Case of Spontaneous Crystallisation of Gypsum. STANISLAS MEUNIER (*Compt. rend.*, 1903, **137**, 942—944).—Balls of plaster of Paris, after immersion for a short time in sea water, were allowed to dry ; under these conditions some of the specimens assumed a crystalline structure, for on breaking them open, the interior, beyond a compact crust of about 4 or 5 mm. thickness, was found to be full of crystals 5 mm. long ; in some cases, fissures appeared on the surface of the balls and they opened spontaneously, showing that the crystallisation is accompanied by a contraction of volume.

The author attributes the phenomenon to the power sea salt possesses of inducing crystallisation, and suggests that the natural crystalline deposits of gypsum may be due to the same cause.

M. A. W.

The First Anhydrous Modification of Calcium Sulphate. PAUL ROHLAND (*Zeit. anorg. Chem.*, 1903, **36**, 332—339. Compare Abstr., 1902, ii, 601 ; 1903, ii, 545).—The substance (anhydrite 1) formed by heating gypsum above 130° is distinct from the hemihydrate and from Estrich gypsum (anhydrite 2) and, although it can be hydrated, is unsuitable for moulding purposes. The influence of various catalysts on the hydration of these different varieties of calcium sulphate has been studied by the author. Potassium dichromate, the sulphates of potassium, sodium, and aluminium, the nitrates of sodium and potassium accelerate the hydration of anhydrite, and the hemihydrate, whilst ammonium chloride and magnesium chloride retard the hydration. Sodium chloride accelerates the hydration of anhydrite 2 and the hemihydrate, but is indifferent in the case of anhydrite 1. Anhydrite 1 appears to be a transitional compound between anhydrite 2 and the hemihydrate.

Three theories are advanced in connection with the behaviour of anhydrite 1. The acceleration of the rate of hydration may be due to the ease with which the resulting compound crystallises; anhydrite 1 does not set, because no nucleus of gypsum is present; formation of complex ions may be assumed, anhydrite 2 setting in presence of positive catalysts (for instance, sodium sulphate) only.

Anhydrite 1 is more stable than anhydrite 2, since the former requires a longer time to set than the latter. A. McK.

Solubility of Calcium Sulphate in Aqueous Solutions of Sulphuric Acid. FRANK K. CAMERON and J. F. BREAZEALE (*J. Physical Chem.*, 1903, 7, 571—577. Compare Abstr., 1902, ii, 75, 207).—The temperatures at which determinations have been made are 25°, 35°, and 43°, and within this range there is no indication of the maximum solubility found for calcium sulphate in pure water (compare Hulett and Allen, Abstr., 1902, ii, 656). If the solubility of calcium sulphate in sulphuric acid is expressed by plotting the weight of calcium sulphate per litre against the weight of sulphuric acid per litre, a curve is obtained which rises to a maximum and then falls off. The positions of the maximum points are as follows: at 25°, 75 grams of H_2SO_4 and 2·84 grams of $CaSO_4$ per litre; at 35°, 85 grams of H_2SO_4 and 3·70 grams of $CaSO_4$ per litre; at 43°, 105 grams of H_2SO_4, and 4·26 grams of $CaSO_4$ per litre. A saturated solution of calcium sulphate in pure water is found to contain 2·126 grams of $CaSO_4$ per litre at 25°, and 2·145 grams of $CaSO_4$ per litre at 43°. For the initial increase of solubility in presence of sulphuric acid, a phenomenon which is apparently opposed to the hypothesis of electrolytic dissociation, explanations are suggested, but not tested.

The introduction of sulphuric acid and calcium sulphate into water is found to cause a contraction or condensation of the solvent.

J. C. P.

Formation of Oceanic Salt Deposits. XXXIII. Deposition of the Calcium Salts Anhydrite, Glauberite, Syngenite, and Polyhalite at 25°. JACOBUS H. VAN'T HOFF and F. FARUP (*Sitzungsber. K. Akad. Wiss. Berlin*, 1903, 1000—1010. Compare van't Hoff and Chiaraviglio, Abstr., 1900, ii, 284; Basch, Abstr., 1901, ii, 168; van't Hoff and Wilson, *ibid.*, ii, 249; van't Hoff, *ibid.*, ii, 558).—The results of a number of previous investigations are discussed and summarised, the conditions of formation of the various substances in presence of each other being represented in the usual graphical manner. It appears that in the evaporation of sea water at 25°

the calcium separates first of all as anhydrite, then as polyhalite, and finally again as anhydrite. J. C. P.

Gypsum and Anhydrite. JACOBUS H. VAN'T HOFF, E. FRANKLAND ARMSTRONG, WILLY HINRICHSEN, FRITZ WEIGERT, and G. JUST (*Zeit. physikal. Chem.*, 1903, **45**, 257—306. Compare Abstr., 1902, ii, 74; 1903, ii, 368).—The present paper, in the main a summary and review of work previously described (*loc. cit.*), contains some new matter.

The vapour tension of gypsum in forming natural anhydrite is greater than that observed in forming soluble anhydrite, and the corresponding relation between tension and temperature is given by the equation $\log p = \log p' + 1{\cdot}486 - 500/T$. This leads to the value 63·5° as the temperature of transition of gypsum into natural anhydrite. In presence of sodium chloride or bromate, the transition takes place at a lower temperature, and from experiments with these salts another formula was deduced, leading to the value 66° for the transition temperature; the former value, however, is considered more trustworthy.

From the various equations giving the relation of tension and temperature, the following heats of hydration q (that is, for 1 kilogram-molecule of water) have been calculated: (1) gypsum from hemihydrate, $q = 2614$ Cal; (2) gypsum from soluble anhydrite, $q = 2370$ Cal; (3) gypsum from natural anhydrite, $q = 2303$ Cal; (4) hemihydrate from soluble anhydrite, $q = 1638$ Cal; (5) hemihydrate from natural anhydrite, $q = 1370$ Cal. Further, the heat of transformation (per kilogram-molecule) of soluble into natural anhydrite is 134 Cal.

The knowledge gained of the relative stability of the various forms of calcium sulphate leads to a survey of their solubilities. If the heat of precipitation of gypsum, which is positive below, and negative above, 37°, is assumed to diminish in a linear manner with the temperature, the solubility of gypsum is given by the formula $\log c = 46{\cdot}8675 - 16{\cdot}25(134{\cdot}7/T + \log T)$, and the values calculated by this formula agree closely with those determined by Hulett (Abstr., 1901, ii, 493; 1903, ii, 260). Similarly, the solubility of anhydrite above 63·5° is given by the formula $\log c = 45{\cdot}3815 - 16{\cdot}25\,(103{\cdot}9/T + \log T)$. For the solutions saturated with the metastable hemihydrate, the following applies: $\log c = 45{\cdot}7475 - 16{\cdot}25\,(108{\cdot}5/T + \log T)$.

If E is the work done when a kilogram-molecule of water is taken up by calcium sulphate, $E = 2\,T.\log_e p'/p$, where p' and p are the vapour tensions of water and hydrate respectively at the temperature T. If this relationship is combined with the tension-temperature equations, the following values of E are obtained: (1) gypsum from hemihydrate, $E = 737 - 6{\cdot}88t$; (2) gypsum from soluble anhydrite, $E = 602 - 6{\cdot}48t$; (3) gypsum from ordinary anhydrite, $E = 435 - 6{\cdot}84t$; (4) hemihydrate from soluble anhydrite, $E = 197 - 5{\cdot}28t$; (5) hemihydrate from ordinary anhydrite, $E = -471 - 6{\cdot}72t$. In these various equations, the conditions of equilibrium find their simplest expression, the transition temperatures being those values of t obtained when E is zero. J. C. P.

Solubility of Magnesium Carbonate in Aqueous Solutions of Certain Electrolytes. FRANK K. CAMERON and ATHERTON SEIDELL (*J. Physical Chem.*, 1903, **7**, 578—590. Compare Abstr., 1902, ii, 320).—The solubility of magnesium carbonate in sodium chloride solutions of increasing concentration rises to a maximum and then falls off. With an atmosphere containing only carbon dioxide and water vapour at atmospheric pressure, the solubility of magnesium carbonate (as magnesium hydrogen carbonate) in sodium chloride solutions diminishes regularly as the sodium chloride concentration increases. The solubility of magnesium carbonate in sodium sulphate solutions, under the same conditions, increases slightly and then decreases with rising sodium sulphate concentration. With an atmosphere free from carbon dioxide, the solubility of magnesium carbonate increases and then decreases in solutions of sodium chloride, whilst in solutions of either sodium sulphate or carbonate it regularly increases with the concentration. The solubility of magnesium carbonate in sodium sulphate solutions, in the absence of carbon dioxide, appears to decrease as the temperature rises. When appreciable quantities of carbon dioxide are present in the vapour phase in contact with solid magnesium carbonate and solutions of other salts, there is a marked tendency towards conditions of false equilibrium. J. C. P.

Zinc Peroxide. BASIL B. KURILOFF (*Compt. rend.*, 1903, **137**, 618—619).—The author claims that he has already indicated (*J. Russ. Phys. Chem. Soc.*, 1900, **22**, 180) that by the oxidation of zinc oxide with hydrogen peroxide intermediate oxidation products of the type described by de Forcrand (Abstr., 1902, ii, 322 and 606) as zinc peroxides are obtained. He asserts, however, that these substances are not definite compounds, and that only one zinc peroxide, $ZnO_2,Zn(HO)_2$, has so far been definitely proved to exist.

T. A. H.

Double Salts of Cadmium Iodide and Bromide. JOSEF M. EDER (*Zeit. anorg. Chem.*, 1903, **36**, 412—413).—A list of double salts of cadmium iodide and bromide prepared by the author (*Phot. Korresp. Wien*, 1876, **13**, 83) is quoted. Those salts were prepared in Wesselsky's laboratory, but not by Wesselsky, as Grossmann (Abstr., 1903, ii, 146) imagines. A. McK.

New Thallic Potassium Selenate. VALENTINO FORTINI (*L'Orosi*, 1902, **25**, 397—399).—The author has prepared double salts having the following compositions: $Tl_2(SeO_4)_3,K_2SO_4,8H_2O$ and

$$Tl_2(SeO_4)_3,(NH_4)_2SO_4,8H_2O.$$

These are similar to the corresponding double sulphates described by Piccini and the author (Abstr., 1902, ii, 607). T. H. P.

Two New Double Halogen Salts. B. GOSSNER (*Zeit. Kryst. Min.*, 1903, **38**, 501—503).—A concentrated solution of ammonium iodide dissolves an appreciable amount of cuprous iodide, and the solution deposits orthorhombic crystals of cuprous ammonium iodide, CuI,NH_4I,H_2O.

A solution of manganous chloride containing excess of magnesium chloride deposits large, pale red, hexagonal crystals of magnesium manganous chloride, $2MgCl_2,MnCl_2,12H_2O$.

Crystallographic descriptions of these are given. L. J. S.

Complete Separation in the Series of the Rare Earths. GEORGES URBAIN and HENRI LACOMBE (*Compt. rend.*, 1903, **137**, 792—794).—By taking advantage of the isomorphism that exists between bismuth magnesium nitrate and the corresponding double salts of magnesium and the metals of the rare earths (this vol., ii, 43), the authors have effected for the first time a complete separation in the series of the rare earths. Thus, when a solution of bismuth magnesium nitrate and the double nitrate of magnesium and the earth rich in samarium is fractionally crystallised, the first few fractions contain all the rare earth, whilst from a solution of bismuth magnesium nitrate and the double nitrate of magnesium and the rare earth rich in gadolinium (and poor in samarium) the rare earth is found in the last crystalline fractions. M. A. W.

Properties of the Aluminium-Tin Alloys. W. CARRICK ANDERSON and GEORGE LEAN (*Proc. Roy. Soc.*, 1903, **72**, 277—284. Compare Heycock and Neville, Trans., 1890, **57**, 376; Gautier, Abstr., 1896, ii, 602, 646).—The liquidus curve or freezing point curve slopes gradually downwards from the freezing point of aluminium until a mixture is reached containing about 25 per cent. of aluminium. From all mixtures containing from 17 to 25 per cent. of aluminium the initial separation of solid takes place practically at the same temperature, namely, 561°. Thereafter the curve falls rapidly to a eutectic point at 228—228·5° and 0·5 per cent. of aluminium. From the flattening of the liquidus curve referred to above, the authors infer the existence of the compound AlSn (18·5 per cent. aluminium).

All the alloys examined liberate hydrogen from water, and a polished surface exposed to moist air is rapidly pitted. Examination of polished surfaces after water corrosion shows that the action begins round the edge of the areas occupied by the aluminium-rich constituent.

The microscopic structure of the alloys is illustrated by a few photographs. In alloys containing more than 0·5 per cent. of aluminium, two constituents are always visible, the substance which crystallised primarily and the eutectic mixture. By annealing the alloys, the constituent of higher melting point can be made to segregate into patches. J. C. P.

Compound of Aluminium Sulphate with Sulphuric Acid. E. BAUD (*Compt. rend.*, 1903, **137**, 492—494).—When bauxite or aluminium hydroxide is boiled with sulphuric acid previously diluted with its own weight of water, there is formed, when the concentration of the acid reaches 75 per cent., the additive *compound*, $Al_2O_3,4SO_3,4H_2O$ (compare Deville, *Ann. Chim. Phys.*, 1860, [iii], **61**, 309). This crystallises in colourless needles, dissolves slowly in cold water, and more rapidly on warming. It is also formed when aluminium sulphate is dissolved in sulphuric acid at 110—120°. T. A. H.

Crystalline Form of Indium, and its Position in the Periodic System. A. Sachs (*Zeit. Kryst. Min.*, 1903, **38**, 495—496).—Electrolytically prepared crystals of indium are regular octahedra. This supports the present reference of indium to the aluminium group rather than to the zinc group, crystals of aluminium being cubic while those of zinc are hexagonal. L. J. S.

Stimulating or Paralysing Influences Acting on Manganese regarded as a Metallic Enzyme. Auguste Trillat (*Compt. rend.*, 1903, **137**, 922—924).—The behaviour of manganous salts as metallic enzymes was examined by measuring the volume of oxygen absorbed in a given time by a definite quantity of gallic acid, quinol, pyrogallol, or tannin, in the presence of a manganous salt (chloride, sulphate, or acetate); under these conditions, the manganous salts only become active in the presence of an alkali hydroxide or a salt of an alkaline earth, the increase in the rate of oxidation being proportional to the quantity of alkali hydroxide present, whilst for the same quantity of alkali hydroxide an increase in the quantity of the manganous salt beyond a certain limit has a paralysing effect. Certain substances, such as arsenic acid, mercuric chloride, prussic acid, and hydrogen sulphide, which act as poisons on organisms, have the effect of retarding the reaction. M. A. W.

A Complex Double Salt of Manganous Acid and Tungstic Acid. Alexander Just (*Ber.*, 1903, **36**, 3619—3622).—When a solution of manganous sulphate is added to a boiling solution of sodium tungstate, manganous tungstate is precipitated. Sodium persulphate is now added, and the solution is boiled for 15 minutes, the volume being kept constant. The dark red solution is filtered from a small quantity of manganese dioxide, and, after a time, red crystals of the colour of potassium dichromate separate. The composition of the salt is represented by the formula $3Na_2O,5WO_3,MnO_2,18H_2O$, derived from quadrivalent manganese. Solutions of the salt decompose slowly in the cold, rapidly on heating, with deposition of manganese dioxide; it can, however, be crystallised from solutions of sodium tungstate. It may be regarded as a double salt of sodium manganotetratungstate and sodium tungstate, $Mn(WO_4Na)_4,Na_2WO_4$. Most metallic salt-solutions yield precipitates. The polytungstates and metatungstates form similar complex salts, which will be further investigated. C. H. D.

Behaviour of Aqueous Salt Solutions towards Iron Powder. Paul N. Raikow and O. Goworuchin-Georgiew (*Chem. Zeit.*, 1903, **27**, 1192—1194).—Nitrites, chlorates, bromates, iodates, and chromates, and all those salts the corresponding acids of which form an iron salt insoluble in water, do not form with iron powder an iron salt which is soluble in water. All normal salts of metals of the alkalis and alkaline earths, and those acid salts which possess a distinct alkaline reaction, behave similarly. Soluble iron salts, on the other hand, are formed by the action of iron powder on the normal salts of the heavy metals, zinc, cadmium, silver, copper, &c., on ammonium salts and on those acid salts which have an acid reaction. A. McK.

Occurrence of Iron in Sulphur. RUDOLF VON HASSLINGER (*Monatsh.*, 1903, **24**, 729—736. Compare Biltz and Preuner, Abstr., 1902, ii, 132).—All naturally occurring sulphurs and commercial sulphurs, even those marked "sulph. puriss. cryst.," contain an impurity which is soluble in solvents which dissolve sulphur and is partly volatile with sulphur. On distillation of sulphur, the impurity is partly decomposed, leaving a black residue which consists of a compound of carbon and iron, has a greater sp. gr. than sulphur, is insoluble in sulphur solvents, and when heated in air burns with formation of ferric oxide. This black residue is not identical with Magnus's "black sulphur" (Knapp, Abstr., 1891, 877). Sulphur free from the impurity is obtained on careful oxidation of purified hydrogen sulphide. The impurity is formed on distilling this sulphur with iron and a hydrocarbon, but not with iron alone. G. Y.

Pentamminenitrosocobalt Salts. JULIUS SAND and OTTO GENSSLER (*Annalen*, 1903, **329**, 194—209. Compare Abstr., 1903, ii, 549).—This paper is a more detailed account of the work previously published (*loc. cit.*); it contains the following additional facts. The nitrate of the red series of pentamminenitrosocobalt salts is slowly oxidised in aqueous solution to xanthonitrate (pentamminenitritocobalt nitrate) which is obtained in yellow crystals; by treatment with cold 68 per cent. nitric acid, the nitroso-compound is converted into pentamminenitratocobalt nitrate, $Co[N_2O(NO_3)_2](NH_3)_{10}(NO_3)_4$, no nitrous oxide being evolved.

Of the additive products of the red nitrate, the following are described: the *additive* compound with lead nitrate,

$$Co_2(N_2O_2)(NH_3)_{10}(NO_3)_4,\tfrac{1}{2}Pb(NO_3)_2,$$

forms lustrous, yellowish-red needles. With potassium iodide in the presence of nitric acid, the *salt*, $Co_2(N_2O_2)(NH_3)_{10}(NO_3)_4,2HI$, is obtained in well-formed, brownish-yellow crystals. When the nitrate is treated with a concentrated solution of potassium iodide in the absence of nitric acid, the double *salt*, $Co_2(N_2O_2)(NH_3)_{10}(NO_3)_2I_2,KI$, is obtained as a very soluble, brownish-red solid.

The corresponding pentamminenitrosocobalt sulphate reacts with oxalic acid, yielding an insoluble *oxalate*,

$$Co_2(N_2O,C_2O_4)(NH_3)_9(C_2O_4H)_4,H_2O,$$

which crystallises in pale red, prismatic needles; from the mother liquor, alcohol precipitates the purple *pentamminesulphatocobalt sulphate*, $\{Co[(SO_4)(NH_3)_5]\}_2SO_4,\tfrac{1}{2}C_2O_4H_2$, which is very soluble in water. The red sulphate is decomposed by fuming hydrochloric acid, the *chloride*, $CoCl(NH_3)_5Cl_2$, being deposited as a purple-red precipitate. Concentrated sulphuric acid effects a similar decomposition, nitrous oxide being set free quantitatively. K. J. P. O.

Hydrates of Nickel Sulphate and Methyl Alcohol. CORNELIS A. LOBRY DE BRUYN (*Rec. trav. chim.*, 1903, **22**, 407—420. Compare Abstr., 1893, 244, and 1903, ii, 651).—The author has determined the solubilities of the various hydrates of nickel sulphate in methyl alcohol, water, and mixtures of these two solvents. Since solutions of hydrated nickel sulphate in methyl alcohol are supersaturated with regard to the salt $NiSO_4,3H_2O,3MeOH$, the solutions were prepared by gradual diffusion without external mechanical agitation. The amount of salt in solution was determined by precipitating the nickel as oxide. The following new hydrates have been obtained. Nickel sulphate hexahydrate (β-form) separates from a concentrated solution of nickel sulphate in methyl alcohol on the addition of 1/4 to 1/2 its volume of water. This hydrate is greener in colour than the ordinary α-hexahydrate, into which it appears to be slowly converted when kept. Nickel sulphate tetrahydrate was obtained by crystallisation from a solution of the heptahydrate in sulphuric acid of sp. gr. 1·4 (compare Steele and Johnson, Trans., 1904, **85**, 113).

The results of the solubility determinations, which are tabulated in the original, show that the heptahydrate is most soluble in methyl alcohol and the tetrahydrate least soluble; of the two hexahydrates, the β-form is the more soluble. The differences in solubility shown by the hydrates are less marked or disappear entirely with mixtures of methyl alcohol and water. For all the hydrates, the solubility reaches a minimum in mixtures containing 80 per cent. of methyl alcohol and 20 per cent. of water.

When excess of the heptahydrate is boiled with methyl alcohol, the resulting solution contains 18·9 per cent. of nickel sulphate, and on cooling retains 12·8 per cent., the deposited salt consisting of the β-hexahydrate. When excess of the α-hexahydrate is boiled with methyl alcohol, 22·1 per cent. of nickel sulphate dissolves; this solution deposits on cooling 20·1 per cent. of a mixture of the original hexahydrate with the compound $NiSO_4,3H_2O,3MeOH$. The latter is best obtained by the addition of small quantities of water to solutions of nickel sulphate in methyl alcohol. It forms crystalline crusts, and on exposure to air rapidly loses methyl alcohol. The salt is dissociated when placed in mixtures of methyl alcohol and water containing more than 15 per cent. of the latter. It is more soluble in ethyl alcohol than in methyl alcohol.

T. A. H.

Nickelammonium Hydroxide. G. Starck (*Ber.*, 1903, **36**, 3840. Compare Bonsdorff, Abstr., 1903, ii, 598).—The solubility of nickelous hydroxide in ammonium hydroxide has been determined in the following values obtained:

Conc. of ammonia	1*N*	2*N*
Conc. of nickel	0·014*N*	0·036*N*.

J. J. S.

Preparation of Metallic Thorium and Yttrium and their Alloys. Siemens & Halske, Akt.-Ges. (D.R.-P. 146503).—Mixtures of thorium or yttrium salts with salts of more fusible metals, as tin, lead, zinc, antimony, aluminium, or copper, are reduced by sodium vapour or by sodium hydroxide and carbon. Or the fluorides of the rare earth metals may be heated with metallic tin or lead. In either case an alloy is obtained, from which the pure thorium or yttrium may be extracted electrolytically or by means of appropriate chemical solvents.

C. H. D.

Radioactive Thorium. Fritz Zerban (*Ber.*, 1903, 36, 3911—3912. Compare Abstr., 1903, ii, 732).—All minerals, for example monazite from Bahia, South Carolina, and Australia, which give radioactive thoria, contain, contrary to Barker's statement, small quantities of uranium. Minerals such as gadolinite from Sotersdal, and Norwegian orthite and yttrotitanite, which are free from uranium, give inactive thorium. W. A. D.

Electrolytic Preparation of Vanadium and its Alloys. Gustav Gin (*Zeit. Elektrochem.*, 1903, 9, 831—832).—The electrolyte consists of fused calcium fluoride, to which some fluoride of iron is added. The anode consists of a mixture of vanadium trioxide and carbon, compressed and roasted in the way used in making anodes of carbon alone, the cathode is a bath of fused steel. In making alloys containing more than 25 per cent. of vanadium, a current density of 2 amperes per sq. cm. at the anode and 6 amperes per sq. cm. at the cathode is used; 11 to 12 volts are required. The author supposes that iron fluoride is electrolysed, the fluorine liberated reacting with the anode, thus: $6F + V_2O_3 + 3C = 2VF_3 + 3CO$; the vanadium fluoride dissolves in the fused calcium fluoride and is then itself electrolysed.

T. E.

Compounds of Quadrivalent Vanadium. II. Iwan Koppel and R. Goldmann (*Zeit. anorg. Chem.*, 1903, 36, 281—301. Compare this vol., i, 7).

Constitution of the Double Salts of Antimony Pentachloride and Chromium Chloride. Paul Pfeiffer (*Zeit. anorg. Chem.*, 1903, 36, 349—354).—Weinland and Feige (Abstr., 1903, ii, 218) have prepared various double salts of antimony pentachloride, which they regard as derivatives of metachloro-, pyrochloro- and orthochloroantimonic acids respectively. The author shows that the salt $CrCl_3,SbCl_5,10H_2O$ is not a derivative of the ortho- acid. According to Weinland and Feige, the salt $CrCl_3,3SbCl_5,13H_2O$ crystallises in violet-gray needles, whilst the salt $CrCl_3,SbCl_5,10H_2O$ forms green leaflets; the latter salt was obtained by the author in the form of dark green crystals. The solutions obtained in both cases, however, when the antimony is removed by hydrogen sulphide, are not identical, since in the one case a violet solution and in the other a green solution is formed. These solutions are identical with those of the compounds $[Cr_2(OH_2)_6]Cl_3$ and

$$[Cr(OH_2)_4Cl_2]Cl,2H_2O.$$

The salts of Weinland and Feige should be formulated thus:

$$[SbCl_6]_3[Cr(OH_2)_6],7H_2O$$

(violet), and $[SbCl_6][Cr(OH_2)_4Cl_2],6H_2O$ (green). In the violet salt, the chlorine atoms are in the negative radicle, but in the green salt they are divided between both radicles. Those salts are analogous to the iron salts, $[SbCl_8]Fe,8H_2O$ and $[SbCl_6][Fe(OH_2)_4Cl_2],4H_2O$.

It is further pointed out that the large majority of chlorine salts containing quinquevalent antimony are derivatives of Werner's type, $[SbCl_6]M'$. A. McK.

Kermes Mineral. J. Bougault (*Compt. rend.*, 1903, **137**, 794).—Kermes mineral owes its therapeutic value to antimony oxide which is formed by the action of the acids of the stomach on the antimony sulphide and sodium pyroantimonate contained in the compound (compare Feist, Abstr., 1902, ii, 507). M. A. W.

Bismuth Oxychloride and Oxybromide. Walter Herz (*Zeit. anorg. Chem.*, 1903, **36**, 346—348).—Bismuth oxychloride, prepared by the addition of water to bismuth trichloride, does not contain water of crystallisation. When heated, it gradually turns yellow and in part brown; when cooled, the original white colour is not restored. When heated, it forms a slight sublimate of tiny, glistening crystals. It is superficially blackened at the ordinary temperature under the influence of light. Bismuth oxybromide closely resembles the oxychloride. A. McK.

Fusibility of Mixtures of Sulphur and Bismuth. Henri Pélabon (*Compt. rend.*, 1903, **137**, 648—550).—Bismuth sulphide and bismuth when melted form a homogeneous liquid the points of solidification of which lie between that of bismuth sulphide (685°) and bismuth (255°). The fusibility curve of the mixtures obtained by plotting as ordinates solidification temperatures determined from the cooling curves against the percentage composition in sulphur of the corresponding mixtures as abscissæ, shows three straight portions with two angular points, forming a broken line concave to the abscissa. One of the angular points is at the temperature of 435°, the solidification temperature of a mixture containing one-sixteenth of an atom of sulphur to 1 atom of bismuth; the other angular point is at 685°, the solidification temperature of bismuth sulphide, BiS; beyond this point the curve can only be traced a short distance to a point corresponding with a mixture of four atoms of sulphur with three of bismuth, because when the sulphur exceeds this proportion, the excess does not unite with the mixture. These results agree with those previously obtained by the author in studying the action of hydrogen on bismuth sulphide (Abstr., 1901, ii, 165). M. A. W.

Fusibility of Mixtures of Bismuth Monosulphide and Silver Sulphide; and of Bismuth Monosulphide and Antimony Sulphide. Henri Pélabon (*Compt. rend.*, 1903, **137**, 920—922).—The freezing point curve of mixtures of bismuth monosulphide and silver sulphide, obtained by plotting the solidification temperatures as ordinates and the percentage of silver sulphide in the mixture as abscissæ, consists of five straight lines showing two minima and one maximum; the two minima correspond with the two eutectic mixtures containing Ag_2S 6·5 and 72 per cent. respectively, and melting at 648° and 585°; the maximum corresponds with the compound $Ag_2S,4BiS$ and melts at 750°. Between the maximum and second minimum the curve shows an angular point corresponding with a mixture in which the two sulphides are present in the proportion indicated by the formula $Ag_2S,2BiS$.

The freezing point curve of mixtures of antimony sulphide and bismuth monosulphide consists of three straight lines inclined at angles very little removed from 180°; the two angular points correspond with mixtures in which the sulphides are present in the proportions indicated by the formulæ $3BiS,Sb_2S_3$ (m. p. 632°) and $BiS,4Sb_2S_3$ (m. p. 591°) respectively. M. A. W.

A Series of Compounds of Bismuth. Georges Urbain and Henri Lacombe (*Compt. rend.*, 1903, **137**, 568—569).—Bismuth nitrate forms a series of double salts having the general formula $3M''(NO_3)_2,2Bi(NO_3)_3,24H_2O$ (in which M'' represents magnesium, zinc, nickel, cobalt, or manganese), isomorphous with the double nitrates of the rare earths and the corresponding metal of the magnesium series. The double salts effloresce in dry air; they are deliquescent, that of manganese being the most, and those of nickel and magnesium the least so; and like all bismuth salts they are decomposed by water.

Magnesium bismuth nitrate is colourless, melts with decomposition at 71°, and has the sp. gr. 2·32 at 16°/16°. *Zinc bismuth nitrate* is colourless, melts and decomposes at 67·5°, and has the sp. gr. 2·75 at 16°/16°. *Nickel bismuth nitrate* is green, melts without decomposition at 69°, and has the sp. gr. 2·51 at 16°/16°. *Cobalt bismuth nitrate* is red, and more orange in tint than the corresponding salt of neodymium; it melts without decomposition at 58° and has the sp. gr. 2·48 at 16°/16°. *Manganese bismuth nitrate* is pale red. It is the most unstable of the series and does not exist in contact with the solid phase of either constituent; it melts without decomposition at 43—44° and has the sp. gr. 2·42 at 16°/16°. M. A. W.

Colloidal Gold. Absorption Phenomena and Allotropy. J. C. Blake (*Amer. J. Sci.*, 1903, [iv], **16**, 381—387).—"Yellow gold" is golden in reflected light and blue in transmitted light; "blue gold" is dark bronze in reflected light and blue in transmitted light; "red gold" is light golden in reflected light and red in transmitted light. Red gold solution was prepared by pouring an ethereal solution of gold chloride (dried at 170°) into water in which ether and acetylene had been dissolved. Solutions made in this manner were precipitated by solutions of various barium salts and the coagulum analysed for gold, barium, and carbon. When the gold chloride was not all reduced, the colloidal gold was separated in a spongy form by the barium salts. Very little of the barium compound is retained by the gold under those conditions. When the gold chloride is all reduced, the colloidal gold was separated by the solution of barium salt in the non-coherent blue form. So long as the solution is even slightly acid, traces of barium are retained by the gold, but when the solution is alkaline, an appreciable amount of barium is retained by the gold, a result in accordance with van Bemmelen's equation for absorption from solution by porous solids, $C''_{\mathrm{KOH}} = f(C'_{\mathrm{K_2SO_4}}, C'_{\mathrm{SO_3}})$, where C''_{KOH} represents the concentration of the base in the liquid retained by the solid, and C' the concentrations of the given substance in the supernatant liquid.

Absorption phenomena are not markedly concerned in the colour changes effected by electrolytes in red gold solutions or in the subsequent precipitation of the spongy or the blue gold. A. McK.

Gold Fluoride. VICTOR LENHER (*J. Amer. Chem. Soc.*, 1903, **25**, 1136—1138).—Moissan states that at a red heat, gold is attacked by fluorine, a yellow hydroscopic substance being formed which readily decomposes into gold and fluorine. The author finds that gold oxide is not dissolved by hydrofluoric acid. When aqueous solutions of gold chloride and silver fluoride are mixed, gold hydroxide is quantitatively deposited along with silver chloride. It is supposed that gold fluoride is incapable of existence in the presence of water.

A. McK.

Oxidisability of Platinum. LOTHAR WÖHLER (*Ber.*, 1903, **36**, 3475—3502. Compare Engler and Wöhler, Abstr., 1902, ii, 127).—Platinum black absorbs 2·3 per cent. of oxygen when heated at temperatures up to 280° in an atmosphere of pure oxygen, equilibrium only being attained after several weeks. When such oxidised platinum black is extracted with dilute hydrochloric acid in an atmosphere of carbon dioxide, 12—18 per cent. of the platinum passes into solution in the form of platinous chloride. If the whole of the oxygen were combined in the form of soluble platinous oxide, 25 per cent. of platinum would dissolve, but a part of the oxygen forms an insoluble oxide, as is shown by the oxidising action of the residual metal on a solution of diphenylamine in sulphuric acid. Mond, Ramsay, and Shields (Abstr., 1898, ii, 599) also found that the heat of absorption of oxygen by platinum black corresponds closely with the heat of formation of platinous hydroxide. The oxidising action of platinous hydroxide on potassium iodide, arsenious acid, organic compounds, &c., is identical with that of platinum black.

Platinous hydroxide only begins to decompose when heated at about 400° in a vacuum or in carbon dioxide; platinic hydroxide passes into the platinous compound below 300°, but the less water is present the more slowly the decomposition goes on.

Platinum sponge, and even thin platinum foil, absorb oxygen with superficial blackening at 420—450°, the product containing as much as 43 per cent. of anhydrous platinous oxide. Hydrochloric acid extracts only traces of platinum, but the addition of a minute quantity of platinous chloride greatly hastens solution. Platinic chloride has no such action.

Catalytic oxidation by means of platinum may take place in two ways, in accordance with the presence or absence of water. In the first case, Pt_xO_y passes into $Pt_x(O_2)_y$; in the second, the reaction $Pt + 2H_2O + O_2 = Pt(OH)_2 + H_2O_2$ takes place. Platinum can also, in the absence of oxygen, decompose water with the evolution of hydrogen, for example, in solutions of cyanides, platinum being dissolved as complex ions. The dissolution of platinum is very rapid when hydrogen peroxide is added to the cyanide solution. C. H. D.

Constitution of Ruthenium Potassium Nitrosochloride in Aqueous Solution. S. C. LIND (*J. Amer. Chem. Soc.*, 1903, **25**, 928—932).—Determinations of the electrical conductivity of ruthenium potassium nitrosochloride showed that aqueous solutions of the substance in varying concentrations are perfectly stable; in two weeks, the conductivity of the solutions did not change. The values for the molecular conductivity were nearly identical with those for potassium platinichloride. The values for the lowering of the freezing point of water indicated that the salt is partially dissociated into three ions, the value for van't Hoff's coefficient varying from 2·52 to 2·72 in 1/20 to 1/70 molar solution respectively. The degree of dissociation, deduced from the freezing point experiments, is in close agreement with the value for potassium platinichloride and is in accordance with the value obtained from the conductivity experiments. The direction of migration of the coloured ions showed that the ruthenium was present in the negative ion. A. McK.

Mineralogical Chemistry.

Italian Petroleum. II. LUIGI BALBIANO and P. ZEPPA (*Gazzetta*, 1903, **33**, ii, 42—50. Compare Balbiano and Palladini, Abstr., 1902, ii, 567).—The fractions of the petroleum from Valleja, boiling between 87° and 102°, contains no olefines, but a study of its oxidation products indicates the presence of benzene, *cyclo*hexane, methyl*cyclo*pentane, and 1 : 3-dimethyl*cyclo*pentane. T. H. P.

Hydrocarbons in Louisiana Petroleum. CHARLES E. COATES and ALFRED BEST (*J. Amer. Chem. Soc.*, 1903, **25**, 1153—1158).—An examination of a specimen of Louisiana petroleum showed that hydrocarbons of the series C_nH_{2n-2} and C_nH_{2n-4} were the main constituents. A. McK.

Mineralogical Notes. CHARLES H. WARREN (*Amer. J. Sci.*, 1903, [iv], **16**, 337—344).—*Native Arsenic from Arizona.*—This was found as reniform masses lining a cavity in metamorphosed dolomitic limestone at Washington Camp, Santa Cruz Co. It contains a small amount of antimony and a trace of sulphur.

Anthophyllite with Fayalite from Rockport, Massachusetts.—A second large lenticular mass of fayalite (Fe_2SiO_4) has been found in the pegmatite of Rockport (Abstr., 1896, ii, 373). It encloses numerous grains of magnetite, and, where it is bordered by the quartz of the pegmatite, it is surrounded by a zone of fibrous anthophyllite. The anthophyllite is white to light brown in colour; it contains only traces of aluminium and magnesium, and appears to be pure iron anthophyllite ($FeSiO_3$); it has evidently been derived from the fayalite and quartz.

Cerussite and Phosgênite from Colorado.—Massive greyish-white to yellow cerussite from Isle, Custer Co., is remarkable in containing strontium isomorphously replacing lead; analysis gave:

CO_2.	PbO.	SrO.	BaO,CaO.	Alkalis, FeO.	Total.	Sp. gr.
17·02	79·59	3·15	nil	traces	99·76	6·409

The cerussite surrounds, and appears to be an alteration product of, clear brown phosgenite; the latter contains no strontium.

L. J. S.

Eglestonite, Terlinguaite, and Montroydite, New Mercury Minerals from Terlingua, Texas. ALFRED J. MOSES (*Amer. J. Sci.*, 1903, [iv], 16, 253—263).—The three new minerals occur together and in association with cinnabar, native mercury, calomel and calcite at Terlingua, Brewster Co., Texas. BENJAMIN F. HILL, in an accompanying paper (*ibid.*, 251—252), describes the mode of occurrence of the mercury ores in this district.

Eglestonite.—The minute cubic crystals have the rhombic dodecahedron as the predominating form; they have a brilliant adamantine to resinous lustre, and their brownish-yellow colour quickly alters to black on exposure to light. The mean (I) of several analyses by J. S. McCord gives the formula $Hg_6Cl_3O_2$. The crystals, when heated, volatilise as mercury and mercuric chloride, and the loss in weight was assumed to be oxygen.

Terlinguaite.—The monoclinic crystals [$a:b:c = 0·5306:1:2·0335$; $\beta = 74° 16'$] are bright sulphur-yellow, and on exposure to light very slowly alter to olive-green. They are more readily soluble in nitric acid than are crystals of eglestonite. The mean (II) of several analyses by McCord gives the formula Hg_2ClO.

Montroydite.—This is usually found as a velvety incrustation of orange-red needles; larger transparent crystals resemble realgar in colour; the lustre is adamantine to vitreous. The crystals are orthorhombic [$a:b:c = 0·63797:1:1·1931$]. Analysis III shows the mineral to be mercuric oxide, HgO.

	Hg.	Cl.	O.	Total.	Sp. gr.	Hardness.
I.	89·56	7·93	2·43	99·92	8·327	2—3
II.	88·24	7·89	3·47	99·60	8·725	2—3
III.	92·87	—	7·13	100·00	—	<2

A crystallographic description is given of the calomel which is associated with these minerals. An undetermined yellow mineral, which is perhaps an orthorhombic oxychloride of mercury, is briefly described.

L. J. S.

Formula of Bornite. BERNARD J. HARRINGTON (*Amer. J. Sci.*, 1903, [iv], 16, 151—154).—Analyses of massive bornite from various Canadian localities (I—V), and of material crystallised in rhombic dodecahedra from Bristol, Connecticut (VI), all agree with the formula

Cu_5FeS_4. The usually accepted formula, $Cu_3FeS_3(=Cu_5FeS_4+CuFeS_2)$, was based, in 1839, on analyses of Cornish crystals, but these are always impure and usually contain a nucleus of chalcopyrite ($CuFeS_2$). New analyses of Cornish crystals are given under VII and VIII.

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	Cu_5FeS_4.
Cu ...	63·55	62·78	62·73	63·34	63·18	63·24	57·71	57·68	63·27
Fe ...	10·92	11·28	11·05	10·83	11·28	11·20	13·89	15·11	11·18
S ...	25·63	25·39	25·79	25·54	24·88	25·54	27·17	26·46	25·55
Insol.	—	0·30	—	0·38	0·24	—	—	—	—
Total	100·10	99·75	99·57	100·09	99·58	99·98	98·77	99·25	100·00
Sp. gr.	5·085	5·055	5·090	5·029	—	5·072	—	—	—

L. J. S.

Tasmanian Minerals. W. F. Petterd (*Rep. Secr. Mines, Tasmania*, for 1901—2, 1902, 288—303; *Papers and Proc. R. Soc. Tasmania*, for 1902, 1903, 18—33).—Notes are given of eighty mineral species, half of which have not been previously recorded, from Tasmania. Analyses, mostly by S. Pascoe and O. E. White, are given of the following: I, Arsenopyrite, in minute crystals from Ringville. II, Bournonite, in well-developed crystals. III, Dufrenoysite, in large, well-developed, orthorhombic crystals on chalybite from Dundas. IV*a* and *b*, *Histrixite*, an apparently new mineral, from Ringville. This occurs with pyrites, chalcopyrite, tetrahedrite, and bismuthinite as radiating groups of orthorhombic crystals of prismatic habit and striated longitudinally. Colour and streak steel-grey, H. about 2; formula:

$$7Bi_2S_3,2Sb_2S_3,5CuFeS_2$$

[suggesting a mixture]. V*a*, Jamesonite, from Magnet Mine; V*b*, From Mount Bischoff. VI, Stromeyerite, massive, from Mt. Lyell Mine. VII, Tennantite, from Mt. Lyell Mine. VIII, Tetrahedrite, from Mt. Read.

	S.	Bi.	Sb.	As.	Pb.	Cu.	Ag.	Fe.	Insol.	Total.
I.	21·48	—	about 2	43·20	—	—	—	32·95	—	99·63
II.	13·62	—	28·68	—	42·39	11·93	—	1·97	—	98·40
III.	21·79	—	8·53	21·60	32·88	9·08	0·22	6·42	—	100·52
IV*a*.	24·05	55·93	10·08	—	—	6·86	—	5·18	—	102·10
IV*b*.	23·01	56·08	9·33	—	—	6·12	—	5·44	—	99·98
V*a*.	17·51	—	21·48	2·44	40·82	—	0·12	4·91	11·51	98·85
V*b*.	17·82	—	26·74	trace	32·08	—	0·12	5·56	14·28	96·60
VI.	38·27	—	trace	3·17	1·60	32·46	13·80	19·26	—	98·66
VII.	30·77	—	17·10	13·82	—	16·17	0·54	16·39	—	94·79
VIII.	27·21	—	?	2·69	—	29·76	9·82	4·56	(Au=0·0019)	

IX, Dundasite, from Dundas, previously described as a hydrated carbonophosphate of lead and aluminium. The ferric oxide is probably present as an impurity, and a trace of phosphoric acid is due to the presence of admixed pyromorphite. Dundasite is also mentioned as occurring at Mt. Read in association with cerussite and gibbsite [and it may prove to be a mixture of these.—L. J. S.]. X, Knoxvillite (?), as a pale green, granular mineral from Salisbury. Associated with this is another sulphate occurring as large, felted masses of short, silky fibres; this is readily soluble in water and gave analysis XI; it is provisionally named *sclerospathite.* XII, Cerussite, yellowish-green, from Dundas; analysis by J. C. H. Mingaye.

	PbO.	Al_2O_3.	Fe_2O_3.	Cr_2O_3.	SO_3.	H_2O.	CO_2.	Loss on ignition.	Insol.	Total.
IX.	41·86	26·06	5·50	—	—	28·08		—	—	101·50
X.	—	2·48	15·86	8·47	30·32	—	—	40·56	—	97·59
XI.	—	—	14·00	10·64	27·20	—	—	39·19	10·77	101·80
XII.	83·07	—	—	trace	—	—	15·97	—	0·62	99·66

Dolomite, white, from Magnet Mine; analysis by F. O. Hill: CaO, 31·72; MgO, 15·60; Fe, 3·92; Mn, 1·80. L. J. S.

Petterdite, a New Lead Oxychloride. William H. Twelvetrees (*Rep. Secr. Mines, Tasmania*, for 1900—1, 1901, 356—357; *Papers and Proc. R. Soc. Tasmania*, for 1900—1, 1902, 51—52).—This new mineral occurs as attached crystals having the form of thin, hexagonal plates, 5—9 mm. across, with quartz, pyrites, and sometimes campylite, in the Britannia Mine, Zeehan, Tasmania. The colour is white; H. = $1\frac{1}{2}$—2; sp. gr. 7·16. Analysis, by O. E. White, gave:

PbO.	As_2O_5.	P_2O_5.	Sb_2O_3.	Cl.
74·04	2·60	2·10	0·50	20

L. J. S.

Formation of Dolomite. F. W. Pfaff (*Centr. Min.*, 1903, 659—660. Compare Abstr., 1895, ii, 50).—The frequent occurrence of gypsum with dolomite suggests that the latter may have been formed by the action of carbon dioxide on calcium and magnesium sulphates. Experiments in this direction with gypsum were without result, but with anhydrite dolomite was formed. Dolomite was deposited on the slow evaporation of a solution containing carbon dioxide and calcium and magnesium sulphates, together with calcium, magnesium, and sodium chlorides (the latter influencing the formation of anhydrite). L. J. S.

Hydromagnesite and Artinite from Emarese in the Aosta Valley. Luigi Brugnatelli (*Centr. Min.*, 1903, 663—665).—In specimens from the asbestos mines of Emarese, the following minerals were noted: asbestos (tremolite and serpentine), demantoid, aragonite, calcite, hydromagnesite, and artinite. The artinite (Abstr., 1903, ii, 379) occurs as silky tufts (not scales, as stated in the original description) of delicate acicular crystals, and agrees in its characters with the artinite of the Val Lanterna. The hydromagnesite occurs as nodular aggregates of fine scales, the optical characters of which suggest orthorhombic, rather than monoclinic, symmetry. These two minerals are associated together and with corroded calcite, suggesting that they have been derived by the action of solutions of magnesium salts on the calcite. L. J. S.

Alteration of Augite to Carbonates. Ludwig Milch (*Centr. Min.*, 1903, 505—509).—The augites of a volcanic rock from Sumatra have been altered to an aggregate of carbonates with some chlorite. Microscopical examination and microchemical tests proved the presence of three carbonates. Analysis of the portions of the rock soluble in dilute hydrochloric acid and in acetic acid gave: CaO, 3·0; MgO, 2·2; FeO, 1·7; CO_2, 5·4 per cent.; this composition points to calcite, magnesite, and a brown spar. L. J. S.

Identity of Palacheite with Botryogen. ARTHUR S. EAKLE (*Amer. J. Sci.*, 1903, [iv], **16**, 379—380).—Palacheite, recently described by the author as a new mineral (Abstr., 1903, ii, 490), is now found to be crystallographically and chemically identical with botryogen. L. J. S.

Erikite and Schizolite from Greenland. O. B. BÖGGILD (*Meddel. om Grönland*, 1903, **26**, 91—139).—*Erikite.*—This new mineral was found with arfvedsonite, ægirite, analcite, and natrolite in veins penetrating the nephelite-syenite near Julianehaab. The opaque, brown crystals are orthorhombic ($a:b:c=0·5755:1:0·7579$). Sp. gr. 3·493; H. 5½—6. In thin sections, the crystals are seen to be pseudomorphous, and to consist of an intergrowth of two substances. The predominating substance (erikite) is yellow, strongly refracting, and birefringent, and has the structure of a granular aggregate with a reticular arrangement: in the interspaces of this rectangular network is a colourless and feebly refracting and birefringent mineral, which is probably hydronephelinite. Analysis by Chr. Christensen gave the following results, from which a formula is deduced as,

$$8SiO_2,4P_2O_5,4(Ce,La,Di)_2O_3,3Al_2O_3,CaO,3Na_2O,11H_2O.$$

SiO_2.	P_2O_5.	$(Ce,La,Di)_2O_3$.	ThO_2.	Al_2O_3.	CaO.	Na_2O.	H_2O.	Total.
15·12	17·78	40·51	3·26	9·28	1·81	5·63	6·28	99·67

The material analysed being a mixture of two unknown substances, it is impossible to say how far this analysis represents the original composition of the crystals before alteration.

Erikite is placed in a group comprising compounds of silicates, titanates, &c. (mostly metatitanates, &c.), with columbates, tantalates, phosphates, antimonates, &c. (mostly metacolumbates, &c.). In the cubic members (pyrochlore, lewisite, &c.) of this group, the ratio of the acid oxides $RO_2:R_2O_5$ is equal to or less than 1, whilst in all others it is equal to or greater than 2.

Schizolite (Abstr., 1900, ii, 413).—A new crystallographic examination of this mineral shows it to be anorthic, and to be related to pectolite as rhodonite is to wollastonite. Several types of crystals are described and figured. Sp. gr. 2·971—3·133. Colour, rose-red or dark brown. Material from Kangerdluarsuk gave, on analysis by Chr. Christensen, the following results, agreeing with the formula $9SiO_2,6R''O,2(Na,H)_2O$.

SiO_2.	TiO_2.	Ce_2O_3.	Y_2O_3.	FeO.	MnO.	CaO.	Na_2O.	H_2O.
51·06	0·62	0·94	1·03	2·74	9·84	22·89	9·97	0·55

L. J. S.

Datolite from Lištic, Bohemia. FR. SLAVÍK and J. FIŠER (*Centr. Min.*, 1903, 229—235).—At Lištic, near Beroun, clay-slate has been altered, at its contact with diabase, to a compact adinole-like rock consisting mainly of datolite; some quartz and a little felspar are also present. Analysis by H. Friedrich gave:

SiO_2.	CaO.	B_2O_3.	FeO,Fe_2O_3.	Al_2O_3.	MgO.	K_2O.	Na_2O.	H_2O.	Total.	Sp. gr.
44·92	25·56	17·64	3·09	3·40	0·34	3·17	0·57	1·76	100·45	2·916

The excess of silica over that required by the datolite formula ($Ca[B·OH]SiO_4$) is due to the presence of quartz; the low percentage of water suggests that the group OH is partly replaced by the groups OK and ONa. Crevices in the datolite-rock are lined with colourless crystals of datolite, of which a description is given. L. J. S.

Idocrase ("Californite") as an Ornamental Stone. GEORGE F. KUNZ (*Amer. J. Sci.*, 1903, [iv], 16, 397—398).—A compact variety of idocrase occurs abundantly and in large masses in Siskiyou County, California, at a spot ninety miles from Yreka; the associated rock is precious serpentine. It is olive-green to almost grass-green in colour, and takes a fine polish. H. 6½; sp. gr. 3·286. Like the massive idocrase of Piz Longhin in Switzerland, it is thus very similar to jade in appearance. Analysis, by G. Steiger, gave:

SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	TiO_2.	P_2O_5.	H_2O.	Total.
35·85	18·35	1·67	0·39	0·05	33·51	5·43	0·10	0·02	4·47	99·85

The material is well suited for the purposes of an ornamental stone, and for it the name "Californite" is proposed. Its occurrence at two other localities in California is noted. L. J. S.

A Peculiar Diopside from Moravicza, Hungary. ERNST WEINSCHENK (*Tsch. Min. Mitt.*, 1903, 22, 363—367).—In a granular limestone from Moravicza were observed large, bright green crystals of garnet, and imperfect crystals of a light red mineral which was determined to be diopside. Approximate measurements of the crystals suggested anorthic symmetry, but the optical characters agree with those of diopside. The following analysis, by Schindelbeck, shows the presence of much lime and manganese oxide, and the absence of alumina and alkalis.

SiO_2.	FeO.	MnO.	CaO.	MgO.	Loss on ignition.	Total.
51·98	2·96	5·76	28·96	8·59	0·56	98·81

L. J. S.

[Minerals from] the Neighbourhood of Mount Magnitnaia Urals. Józef Morozewicz (*Zeit. Kryst. Min.*, 1903, **38**, 201—204; from *Mém. Com. Géol. St. Pétersbourg*, 1901, **18**, 1—73; *Résumé*, 74—104).—The district around Mount Magnitnaia, situated on the eastern slopes of the southern Urals, consists of igneous and metamorphic rocks, with some sedimentary rocks and large deposits of iron ores. The following mineral analyses are given: I and II, diopside, isolated from augite-diorite from Mount Atatsch; III, augite; IV, garnet; V, augite; VI—VIII, garnet (melanite); IX, epidote.

The augite of the igneous rocks has been altered to garnet, and this to epidote, the final product being quartz, calcite, and iron ores. The large masses of iron ore are considered to have been formed by this process of alteration rather than by magmatic differentiation.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	K_2O.	Na_2O.	H_2O.	Total.	Sp. gr.
I.	51·72	1·00	2·14	5·75	0·20	23·63	13·77	trace	1·13	0·59	99·93	3·330
II.	49·42	4·77	3·95	6·25	0·20	17·91	14·41	trace	1·90	1·51	100·32	3·198
III.	44·16	11·72	4·40	7·25	0·35	21·98	5·44	0·82	1·11	1·58	98·81	3·311
IV.	36·89	6·22	23·49	2·23	0·42	29·97	trace	—	—	0·97	100·19	3·701
V.	50·65	2·26	2·42	11·20	0·60	17·87	14·37	trace	0·82	0·58	100·77	3·196
VI.	35·28	0·40	30·31	0·28	0·46	32·93	trace	—	—	0·98	100·34	3·811
VII.	35·00	2·15	30·41		0·48	31·47	trace	—	—	1·36	100·87	—
VIII.	35·08	8·39	21·09	1·48	0·87	32·98	trace	—	—	0·69	100·58	3·682
IX.	36·58	20·62	16·68	0·37	0·20	23·29	0·24	—	—	2·27	100·25	3·445

L. J. S.

Aluminous and Titaniferous Augites. G. Becker (*Zeit. Kryst. Min.*, 1903, **38**, 317—319; from *Sitzungsber. phys.-med. Soc. Erlangen*, 1901, **33**, 219—267).—The following augites were subjected to prolonged digestion at 60° in dilute hydrochloric acid, and the soluble (*a*) and insoluble (*b*) positions separately analysed. In the soluble portion, $SiO_2 : Al_2O_3 : (Ca,Mg)O = 1 : 1 : 3\frac{1}{2}$. The results are discussed, and complex structural formulæ given: I, augite from Kilimandjaro; sp. gr. 3·36. II, Augite from Falkenberg, Bohemia; sp. gr. 3·39. III, Augite from Fladungen, Rhön; sp. gr. 3·27.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	CaO.	MgO.	Loss on ignition.	Total.
I.	44·89	2·39	3·93	2·72	10·54	22·13	12·79	0·11	99·50
I(*a*).	2·36	0·745	3·875	—	0·73	4·345	2·305	—	14·36
I(*b*).	42·51	1·525	—	3·23	9·63	18·01	10·23	—	85·135
II(*a*).	2·71	1·01	4·37	—	0·86	4·80	2·61	—	16·36
II(*b*).	34·51	5·58	1·76	9·56	—	20·32	10·58	—	82·31
III(*a*).	2·51	2·40	4·14	2·78	6·47	5·06	2·20	—	25·56
					MnO.			Na_2O.	
III(*b*).	21·60	6·31	3·83	12·27	1·37	14·50	8·01	4·77	72·66

L. J. S.

A Pseudo-serpentine from Stevens County, Washington. Frank W. Clarke (*Amer. J. Sci.*, 1903, [iv], **15**, 397—398).—The material described is yellowish-green in colour, takes a fine polish, and closely resembles serpentine in appearance. Microscopical examination shows the presence of at least three minerals, and this is confirmed by the action of acids. Calculated from the following analysis by G. Steiger, the mineralogical composition of the rock is: hydromagnesite, 5·0 ; chlorite, 14·0 ; serpentine, 20·0 ; brucite, 60·0 ; water, 1·0 = 100·0.

SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	H_2O at 100°.	H_2O above 100°.	CO_2.	Total.
13·08	1·63	1·25	0·19	56·44	0·33	0·85	23·94	2·03	99·74

L. J. S.

Composition of some Canadian Amphiboles. BERNARD J. HARRINGTON (*Amer. J. Sci.*, 1903, [iv], 15, 392—394).—Analysis I is of reddish-brown cleavage masses from Granville, Quebec. The presence of so much fluorine is remarkable ; another specimen contained 2·93 per cent. II is of material isolated from the essexite of Montreal ; it is black by reflected light, but brown by transmitted light. Analysis III, by N. N. Evans, is of a similar amphibole from the essexite of Mount Johnson.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	Na_2O.	K_2O.	H_2O.	F.	Total.	Sp. gr.
I.	45·50	0·68	12·25	0·28	0·75	0·11	13·31	20·63	2·76	1·76	0·40	2·80	101·23	3·110
II.	39·23	4·53	14·38	2·92	8·56	0·65	11·70	13·01	3·05	0·98	0·36	—	99·37	3·159
III.	38·63	5·04	11·97	3·90	11·52	0·73	12·81	10·20	3·14	1·49	0·33	—	99·76	—

L. J. S.

Piedmontese Minerals. FERRUCCIO ZAMBONINI (*Centr. Min.*, 1903, 78—84, 117—124).—A garnet-rock from Casteldelfino consists of massive and crystallised garnet, smaragdite, and veins of calcite and diopside. On the surface are colourless, transparent crystals of grossularite with the forms {110}, {211}, &c. ; analysis gave the results under I ; crystals of a very faint yellow colour contain 0·8—1·5 per cent. Fe_2O_3. The diopside forms white, silky, crystalline masses and also prismatic crystals ; analysis II :

	SiO_2.	Al_2O_3.	FeO.	CaO.	MgO.	Loss on ignition.	Total.
I.	40·37	21·83	trace	37·06	0·49	—	99·75
II.	54·58	0·29	1·31	25·73	17·86	0·62	100·39

Several other minerals from various localities in Piedmont are described. L. J. S.

A New Mineral [Grandidierite]. ALFRED LACROIX (*Compt. rend.*, 1903, 137, 582—584).—*Grandidierite* occurs in crystals 8 cm. long, with quartz, orthoclase and almandine, in the pegmatite veins at Andrahomana, Madagascar. The crystals are orthorhombic, glassy, and exhibit the phenomenon of pleochroism to a greater degree than any other known mineral, the crystals appearing colourless when viewed in the direction of their length, and bluish-green in a direction at right angles to this ; sp. gr. 2·99. Analysis, by Pisani, gave :

SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	Na_2O.	K_2O.	H_2O.	Total.
20·90	52·80	6·60	4·86	9·65	2·10	2·22	0·40	1·25	100·78

Corresponding with the formula

$$7SiO_2,11(Al,Fe)_2O_3,7(Mg,Fe,Ca)O,2(Na,K,H)_2O.$$

M. A. W.

Spodumene from California. WALDEMAR T. SCHALLER (*Bull. Dep. Geol. Univ. California*, 1903, **3**, 265—275).—Fine large crystals of transparent spodumene of gem quality have recently been found associated with lepidolite and gem tourmaline in a pegmatite vein near Pala in San Diego County. They are rose-red, magenta, or amethystine-purple in colour, rarely colourless, and exhibit well-marked etch-figures. A crystallographic description is given. The following is the average of several analyses:

SiO_2.	Al_2O_3.	Mn_2O_3.	Li_2O.	Na_2O.	K_2O.	Total.	Sp. gr.
64·42	27·32	0·15	7·20	0·39	0·03	99·51	3·189

L. J. S.

Presence of Heavy Metals in Sandstones. WILLIAM MACKIE (*Trans. Edin. Geol. Soc.*, 1903, **8**, 256—259).—The black stains of manganese dioxide in the sandstones of the Moray Firth basin were found to contain small amounts of copper oxide (0·12 per cent.), nickel and cobalt oxides (0·69 per cent.), and lead. The sandstones themselves were also found to contain traces of these metals disseminated through them; the averages of the determinations made on several sandstones were: copper, 1 part in 77,000; nickel and cobalt, 1 part in 10,800.

L. J. S.

Chemical Composition of Ash from Mont Pelée (Martinique). ETTORE COLONNA (*Atti R. Accad. Torino*, 1903, **38**, 471—476).—Volcanic ash, emitted from Mont Pelée and collected at St. Pierre, gave, on analysis:

SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.
59·90	0·55	17·40	3·54	4·50	slight traces	6·70

BaO.	SrO.	MgO.	Na_2O.	K_2O.	Li_2O.	Cl.
traces	traces	2·25	3·35	0·54	slight traces	0·10

S (as sulphide).	SO_3.	P_2O_5.	Loss on heating.	Total.
0·31	0·48	0·11	0·50	100·23

These numbers are compared with those obtained by Pisani (*Compt. rend.*, 1902, **134**, 1328), Schmelck (Abstr., 1903, ii, 224), and Hillebrand (*J. Amer. Chem. Soc.*, 1902, **24**, 362).

T. H. P.

Meteoric Iron from N'Goureyma, Soudan. EMIL W. COHEN (*Amer. J. Sci.*, 1903, [iv], **15**, 254—258).—This iron, which weighed 37½ kilos., fell on June 15, 1900, at N'Goureyma, near Djenne, Province of Macina, Soudan. The structure is coarsely granular; sp. gr. 7·672. A remarkable feature is presented by the presence of enormous numbers of small bars of troilite of regular and uniform distribution. The peculiarities in form and structure of the mass suggest that it became fused during its passage through the air. Analysis gave:

Fe.	Ni.	Co.	Cu.	Cr.	S.	P.	C.	Cl.	Chromite.	Silicates.	Total.
89·28	9·26	0·60	0·04	0·11	0·77	0·05	0·04	0·01	0·09	0·24	100·49

L. J. S.

Physiological Chemistry.

Respiratory Capacity of Certain Invertebrates. Charles Dhéré (*Compt. rend. Soc. Biol.*, 1903, **55**, 1161—1162).—A few analytical figures are given of the amount of oxygen and of copper in the blood of certain animals which contains hæmocyanin (octopus, crab, &c.). Hæmocyanin resists putrefaction to some extent. When putrefaction occurs in the blood, the oxyhæmocyanin is reduced, but the blue colour returns on shaking with air. W. D. H.

Effect of Rarefied Air on Blood Pressure. Frederic H. Bartlett (*Amer. J. Physiol.*, 1903, **10**, 149—163).—Experiments on rabbits show that rarefaction in the air causes dyspnœa, and in some cases asphyxia. The arterial blood pressure falls. Cutting the vagi intensifies the effects. The conclusion is drawn that in mountain sickness there is an increased amount of blood in the pulmonary vessels, due to an increase in their capacity, and to a stagnation of blood arising from an equalisation of the atmospheric and intrathoracic pressures. Work aggravates the symptoms. W. D. H.

Caisson Disease and Diver's Palsy. Leonard Erskine Hill and John J. R. Macleod (*J. Hygiene*, 1903, **3**, 401—445).—Examination, *ante-* and *post-mortem*, of numerous cases of illness due to the patients having worked in caissons, or as divers, and experiments on animals in addition, show that the symptoms are always the result of decompression, and the consequent liberation of gas in the blood.

W. D. H.

Analysis of the Air of the House of Commons. W. J. Atkinson Butterfield (*J. Hygiene*, 1903, **3**, 486—497). **Micro-organisms in the same Air.** G. S. Graham-Smith (*ibid.*, 498—513).—The general conclusion reached is that the air supply to the House of Commons is exceptionally good, being adequate to avoid a rise of two volumes of carbon dioxide over that present in the incoming air, except close to the ceiling, where the rise is somewhat greater. This is much better than most authoritative standards.

The number of micro-organisms in the open space surrounding the buildings is comparatively small (4·2 per litre on the ground level, and 1·4 at the top of the tower); the air in the debating chamber during a sitting is remarkably pure from the bacteriological standpoint (5·8 per litre, mean of 11 experiments). In the committee, dining, and smoking rooms, the number is larger (32·3 per litre, mean of 6 experiments). No organisms associated with specific diseases in man, and only a few pathogenic to animals, were isolated.

W. D. H.

Activity of Nerves on the Heart Perfused with Ringer's Solution. H. E. HERING (*Pflüger's Archiv*, 1903, 99, 245—252). **Action of the Salts of Ringer's Solution on the Isolated Mammalian Heart.** EMANUEL GROSS (*ibid.*, 264—322).—The experiments were performed in a dead animal by perfusing the heart with Ringer's solution, and with a simplified circulation consisting of the pulmonary circuit, and the coronary vessels. In a monkey, vagus action could be demonstrated in 6 hours, and the action of the accelerator nerves nearly 54 hours later. The conclusion is drawn that the accelerator does not act through the intermediation of ganglion cells on the heart. The second paper relates to the action of the individual salts of Ringer's solution on the isolated surviving heart of mammals, and results were obtained comparable to those published many years ago by Ringer in connection with the frog's heart, results which Loeb has shown are to be interpreted as due to the action of ions.

W. D. H.

Blood of the New Born. ALEX. O. M. FEHRSEN (*J. Physiol.*, 1903, 30, 322—329).—An examination of the blood in forty new born infants shows a high percentage of hæmoglobin (10 to 15 per cent. over the normal); a large increase of red corpuscles with a mean of over six millions per c.mm.; a well-marked leucocytosis (18,000 per c.mm.); an absolute and relative increase in the lymphocytes and large mononuclear cells; the invariable presence of nucleated red corpuscles up to the third hour after birth, and a high colour index.

W. D. H.

Blood of the Skate. DAVID FRASER HARRIS (*J. Physiol.*, 1903, 30, 319—321).—Even in large skates (weighing 600 to 900 grams) there are only about 15 to 20 c.c. of blood; for analytical purposes, a sufficient supply can be obtained from the heart. The blood clots in 5 to 6 minutes. The percentage of hæmoglobin is from 20 to 30 per cent. in Orion's scale, which corresponds with a percentage of 3·5 to 3·8 in the blood. The blood has a sp. gr. 1·035 to 1·038. The number of red corpuscles per c.mm. is 350,000, but this seems to vary with the season. The amount of hæmoglobin per corpuscle is $3\frac{1}{4}$ times as great as in man. The number of leucocytes in the same volume of blood varies from 20,000 to 30,000. The red to white ratio is therefore 10 or 12 to 1.

W. D. H.

Hydroxyl Ions of the Blood. II. RUDOLF HÖBER (*Pflüger's Archiv*, 1903, 99, 572—593. Compare Abstr., 1901, ii, 738).—If platinum electrodes are placed in a mixture of hydrogen and carbon dioxide, they behave like hydrogen electrodes under diminished pressure; the carbon dioxide is electrically indifferent. If the *E.M.F.* of such a chain as $H_2 + CO_2$ | HCl | defibrinated blood | $H_2 + CO_2$ is investigated, and the concentration of hydroxyl ions in the blood calculated for different tensions of carbon dioxide, it is found that at 0 pressure, the hydroxyl equals $40 \cdot 10^{-7}$, at 0·6 atmosphere pressure, $0 \cdot 2 - 10^{-7}$, and at the physiological pressure of 0·028 to 0·054 atmosphere, 2 to $0 \cdot 7 - 10^{-7}$ gram ions. The amount of hydroxyl ions in defibrinated and also in unclotted blood at the CO_2 tension of arterial blood is twice as great as at the CO_2 tension of venous blood. Blood contains somewhat more hydroxyl ions than serum at the same CO_2 tension; the difference is greater when this tension is higher. This is due to interaction of HCO_3 and Cl between corpuscles and serums.

W. D. H.

Behaviour of Carbon Monoxide in the Organism. I. Piero Giacosa (*Atti R. Accad. Torino*, 1902—1903, **38**, 864—882).—A number of experiments were made with the object of deciding the much-discussed question of the oxidisability of carbon monoxide in the blood. The preliminary experiments showed that blood, either obtained from an animal poisoned with carbon monoxide or saturated with the gas after extraction from a healthy animal, and then defibrinated and introduced into tubes kept at 38°, continues to emit carbon monoxide for some hours, at first rapidly, but afterwards with less activity. It is further found that, in presence of fresh pulmonary tissue, part of the carbon monoxide in such blood is oxidised and the decomposition of the carbon monoxide-hæmoglobin compound is accelerated.

T. H. P.

Does Glycerol exist in Normal Blood? Antoine Mouneyrat (*Compt. rend. Soc. Biol.*, 1903, **55**, 1207—1208. Compare Nicloux, Abstr., 1903, ii, 337, 438, 560).—A criticism of Nicloux's methods.

W. D. H.

Glycerol in the Blood. Maurice Nicloux (*Compt. rend. Soc., Biol.*, 1903, **55**, 1229—1231. Compare Abstr., 1903, ii, 438).—A reply to Mouneyrat (preceding abstract).

W. D. H.

Sugar in the Blood. Raphael Lépine and Boulud (*Compt. rend.*, 1903, **137**, 686—689. Compare Abstr., 1901, ii, 610; 1902, ii, 218, 434).—In some cases, fresh venous blood contains more sugar than arterial blood. In the same specimens, an hour later, the sugar in the arterial blood rises above that in the venous blood, which remains stationary. The explanation offered is that free sugar is formed or liberated from some other compound (sucre virtuel).

W. D. H.

Albumoses in the Blood. O. Schumm (*Beitr. chem. Physiol. Path.*, 1903, **4**, 453—459).—In a case of nephritis, proteoses were found in the blood; traces were also observed in a case of pernicious anæmia, but none in healthy human blood.

W. D. H.

The Fertilisation of the Eggs of Echinoderms. Jacques Loeb (*Pflüger's Archiv*, 1903, **99**, 323—356; 637—638. Compare Abstr., 1902, ii, 151).—The eggs of *Strongylocentrotus purpuratus* can be easily fertilised with the sperm of the same species, either in sea-water or van't Hoff's saline solution, which contains the salts of sea-water in the proper proportion, if there is added to 100 c.c. of the solution from 0·1 to 0·2 c.c. of a decinormal solution of sodium hydroxide. Under the same circumstances, they cannot be fertilised, or only slightly, by the sperm of the star-fish, *Asterias ochracea,* but fertilisation occurs if 0·3 to 0·4 c.c. of decinormal sodium hydroxide is added to 100 c.c. of van't Hoff's solution. Using this high proportion of alkali, the eggs are no longer fertilisable by sperm of the same species.

Further experiments confirm the hypothesis that the addition of alkali is necessary to neutralise acid substances produced in the egg, and that it is improbable that in normal fertilisation free hydroxyl ions are necessary. W. D. H.

Proteolytic Action of Extracts of Intestine and Pancreas. Ernst Weinland (*Zeit. Biol.*, 1903, **45**, 292—297).—Experiments were made on fibrin and Witte's peptone, subjected to the action of pancreatic extracts and extracts of the intestine. In both cases, in time, products appeared which no longer gave the biuret reaction. The time occupied was slower than that described by Cohnheim in his work on erepsin. Alkalinity increases the time. In all such experiments, besides reaction, the presence of antiferments, and Vernon's hypothesis that several trypsins exist must be taken into account.

W. D. H.

The Peptone-splitting Ferments of the Pancreas and Intestine. Horace M. Vernon (*J. Physiol.*, 1903, **30**, 330—369).—The peptone-splitting power of ferments can be estimated colorimetrically by the biuret test. The full colour takes some minutes to develop. The time required to split up peptone varies inversely as the quantity of the ferment. In pancreatic extracts, the power is due mainly to pancreatic erepsin, which is quite distinct from trypsin. Such extracts contain but little trypsin (only trypsinogen), and have little or no action on fibrin. When free trypsin appears, the peptone-splitting power is less, probably because trypsin destroys erepsin. Neither pancreatic or intestinal erepsin exists in a soluble zymogen form. Pancreatic erepsin is more readily precipitable by alcohol than intestinal erepsin, and differences in the activity of the two ferments are also noted. The action of both is accelerated by increasing alkalinity up to 0·4 to 1·2 per cent. of sodium carbonate.

W. D. H.

Action of Alkaline Soaps on the Pancreatic Secretion. C. Fleig (*Compt. rend. Soc. Biol.*, 1903, **55**, 1201—1202. Compare Abstr., 1903, ii, 385).—The stimulating action of alkaline soaps on pancreatic secretion is not due to a nervous reflex, but is "humoral" in its action. It produces in the intestine a substance analogous to Bayliss and Starling's secretin. W. D. H.

Proteolytic Enzymes of Ox-spleen and Serum. SVEN G. HEDIN (*J. Physiol.*, 1903, 30, 155—175, 195—201. Compare Abstr., 1901, ii, 402).—Ox-spleen contains two proteolytic enzymes *α-protease*, acting in an alkaline, and *β-protease* in an acid, medium. When obtained in combination with nuclein, they are insoluble in weak acetic acid; when freed from nuclein, they are soluble in this acid. The serum contains anti-substances for the α-, but not for the β-variety. Their action is probably intracellular in the main.

Ox-serum contains a weak proteolytic ferment, which acts in an alkaline medium; this is precipitable with the globulin fraction of the proteids. It is destroyed by heating at 55° for half an hour. It acts on casein, gelatin, and coagulated serum, but not on the globulin itself or on coagulated albumin. Anti-substances, mainly contained in the albumin fraction, prevent it from acting in the serum.

W. D. H.

Influence of Hydrochloric Acid introduced into the Intestine on the Secretion of Bile. ARTHUR FALLOISE (*Bull. Acad. Roy. Belg.*, 1903, 757—791).—Hydrochloric acid introduced into the intestine acts as a cholagogue, but this action is manifested only by its action on the duodenum, and first part of the jejunum. Its action is not immediate, but is preceded by a latent period of from three to five minutes. The flow follows a course similar to that of the pancreatic juice, reaching a maximum from the seventh to the twelfth minute after the injection, and then progressively diminishing until about the twenty-fifth minute. The amount excreted may be four times the volume formed previous to the injection. This is not influenced by anæsthesia or by large doses of atropine. The mechanism is doubtless chemical, like that of prosecretin and secretin in the case of the pancreas. W. D. H.

Influence of Pituitary Gland Substance on Metabolism. JOHN MALCOLM (*J. Physiol.*, 1903, 30, 270—280).—Pituitary bodies from oxen were added to the diet of dogs, and metabolism experiments made in the usual way. The glandular lobe of the pituitary in a dry form tends to cause a retention of nitrogen and probably of chlorine, whilst the output of phosphorus and calcium is increased. There is no diuretic action, as when extracts are given intravenously. Fresh gland substance has the opposite effect on the nitrogen and calcium. The nervous portion of the gland is probably more active than the glandular, and the effect lasts longer. W. D. H.

Chauveau's Researches on [the Nutritive Value of] Alcohol. RUDOLF ROSEMANN (*Pflüger's Archiv*, 1903, 99, 630—633. Compare Abstr., 1901, ii, 668).—Polemical against Kassowitz. W. D. H.

Time Relations of Proteid Metabolism. PHILIP B. HAWK (*Amer. J. Physiol.*, 1903, 10, 115—145).—The experiments were made on two subjects; in both, the normal curve of nitrogen excretion showed two maxima. On a day of extra proteid ingestion, a single maximum occurred. After this ingestion, the curve rose rapidly and immediately, reaching the maximum in six to nine hours in one, and in nine to twelve hours in the other subject; after this, the curve fell rapidly. The course of sulphur excretion was in general terms like that of nitrogen. The minimum phosphorus excretion occurred in the morning after breakfast. W. D. H.

Comparative Physiology of Inanition. II. Inanition in the Snail. B. SLOWTZOFF (*Beitr. chem. Physiol. Path.*, 1903, 4, 460—475).—In inanition, the snail loses 25·74 per cent. of its weight and 28·4 per cent. of its total energy. The daily loss is regular, and there is no *pre-mortem* increase. The shell shares in the wasting, losing 25·5 per cent. of its weight; both organic and inorganic constituents of the shell remain in the same proportion throughout. Full details are given in regard to each constituent of the body. W. D. H.

Osmotic Regulation of Fluids in the Interior of Echinoderms. VICTOR HENRI and S. LALOU (*Compt. rend.*, 1903, 137, 721—723).—The membranes that separate the fluid in the interior of sea-urchins from the external fluid are semipermeable. The same is true for the respiratory membrane and the digestive tube in Holothurians. They allow water to pass but not chlorides, sulphates, urea, or sugar. In this, these membranes resemble that composing the stomach of *Aphysia* described by Botazzi and Enriques. W. D. H.

Local Retention of Chlorides following Injection of Different Substances. CH. ACHARD and L. GAILLARD (*Compt. rend. Soc. Biol.*, 1903, 55, 1189—1190).—If various indifferent crystallised substances (urea, creatine, dextrose) are injected into the tissues or into the serous cavities, there is gradual absorption of these substances and at the same time a transudation of sodium chloride which remains for a time after the absorption of the foreign material. If this retention is excessive, it may lead to hypochloruria.

W. D. H.

Origin of Organic Chlorine Compounds. J. PERIN (*Compt. rend. Soc. Biol.*, 1903, 55, 1166—1167).—Chlorine occurs in the intestine in three forms, hydrochloric acid, sodium chloride, and organic chlorine compounds. The last are stated to exist in the substance of the intestinal mucous membrane of the dog, but not in the intestinal juice. These substances are believed to originate in the stomach, to pass thence to the intestine, where they are absorbed, and taken to the liver by the portal blood. They are stated to be discoverable in the portal blood and in the liver. W. D. H

The Precursors of Fibrin Ferment. P. MORAWITZ (*Beitr. chem. Physiol. Path.*, 1903, 4, 381—420).—Thrombin or fibrin ferment is described as consisting of two substances named α- and β-thrombin respectively; each is preceded by a precursor, α- and β-prothrombin. α-Prothrombin is the prothrombin of Arthus and Pekelharing, which is converted into α-thrombin by calcium salts. β-Prothrombin is converted into β-thrombin by certain substances termed "zymoplastic," such as alkalis, acids, and alcohol, but not by calcium salts. The presence of antithrombin in the blood is probable. Such a hypothesis is stated to explain previous divergences of views. Fresh serum contains α-thrombin and β-prothrombin; old serum only the latter; Schmidt's fibrin ferment contains both thrombins; oxalate plasma, only α-prothrombin; and fluoride plasma neither thrombin nor its zymogens. W. D. H.

[Amount] of Urea in the Tissues and Blood of Vertebrate Animals. NESTOR GRÉHANT (*Compt. rend.*, 1903, **137**, 558—560. Compare Abstr., 1889, 914).—The author records the following percentages of urea: muscle of rabbit, 0·042; guinea-pig, 0·045; duck, 0·000; frog, 0·044; carp, 0·021; ray, 1·37; blood of rabbit, 0·043; guinea-pig, 0·045; duck, 0·000 (compare Garrod, Abstr., 1893, ii, 581; Schondorff, Abstr., 1899, ii, 374). Experiments on the torpedo of Arcachon indicate that the quantity of urea in the electric organ is considerably increased by artificial excitation. M. A. W.

Physiology of Muscle in Warm Blooded Animals. WALTHER FREUND (*Beitr. chem. Physiol. Path.*, 1903, **4**, 438—441).—In warm blooded animals, the muscles are isotonic with a 1·1 to 1·5 per cent. solution of sodium chloride. This is higher than in the frog where the number is 0·7 (Loeb). W. D. H.

Hæmoglobin in Muscles. KARL B. LEHMANN, ARMIN WERNER, HEINRICH STADTFELD, SAMUEL MANDELBAUM, ISIDOR EISENLAUER, and ALBERT IMHOF (*Zeit. Biol.*, 1903, **45**, 324—345).—The result of a large number of observations on the amount of hæmoglobin obtained from various muscles of different animals is given. The muscles were obtained as fresh as possible and therefore contained blood. Speaking generally, the amount of blood pigment is proportional to the activity of the muscles; thus it increases as the muscles become active after birth; in the heart, this increase with age is least noticeable. The heart and diaphragm yield most pigment. The muscles of cold-blooded animals are not deeply coloured; this is related to their low metabolism. Smooth muscles yield but little hæmoglobin.
W. D. H.

Glycolytic Action of the Liver. RAHEL HIRSCH (*Beitr. chem. Physiol. Path.*, 1903, **4**, 535—542).—The glycolysis which occurs in the liver during self digestion is also manifested on dextrose added to the minced organ. The acids formed during autolysis (lactic, succinic, butyric, &c.) are probably derived from the sugar. The addition of pancreas to the mixture greatly increases the rate and amount of loss of the sugar; whether this is of physiological importance in the relationships of the two organs has still to be determined.
W. D. H.

The Pancreas and Glycosuria. JEAN LÉPINE (*Compt. rend. Soc. Biol.*, 1903, **55**, 1288—1289).—Injection of sugar in guinea-pigs produces no change in the islets of Langerhans of the pancreas as Soboleff has stated. Prolonged glycosuria, such as that caused by phloridzin, leads to a slight overgrowth of the islets. Perhaps this indicates a defensive action against glycosuric conditions of extra-pancreatic origin. W. D. H.

The Sugar-destroying Ferment in Organs. J. FEINSCHMIDT (*Beitr. chem. Physiol. Path.*, 1903, **4**, 511—534).—Glycolysis is a cellular function, and occurs in the minced pancreas, liver and muscles, and also in the juices expressed from them. It is evidently a ferment action, and the ferment was to some extent isolated. Among the products of glycolysis are abundant quantities of carbon dioxide, a small amount of alcohol, and acid substances in large amount. The diabetic liver has no glycolytic power. W. D. H.

Osseo-mucoid. CHRISTIAN SIEFERT and WILLIAM J. GIES (*Amer. J. Physiol.*, 1903, **10**, 146—148).—Osseo-mucoid was found in the bones of twenty animals of different genera. It is therefore a probable constituent of all bones. W. D. H.

Conference of Passive Immunity on the same Species, and on a Species other than that providing the Antitoxic Serum. ERNEST F. BASHFORD (*J. Pathol. Bacteriol.*, 1903, **9**, 192—201).—The antitoxin of one species is not quite passive in another species, but evolves a reaction. The existence of anti-antitoxin is regarded as the cause of this. W. D. H.

Leucocytes and Bacteriolysis. GEORGE F. PETRIE (*J. Pathol. Bacteriol.*, 1903, **9**, 130—153).—Although there is a possibility of the leucocytes acting as secretors of alexin or complement, the cytases are not preformed within the cells; the experiments recorded show that no bactericidal substances for the bacteria selected can be obtained from any variety of leucocyte, nor from the cells of spleen, liver, or bone-marrow. W. D. H.

Destruction of Adrenalin in the Organism. GUSTAV EMBDEN and OTTO VON FÜRTH (*Beitr. chem. Physiol. Path.*, 1903, **4**, 421—429).—Suprarenin (adrenalin) is capable of passing unchanged through the vessel's walls, but most of it is destroyed in the blood, probably by oxidation. No particular organ or tissue is proved to have any distructive influence on this substance, although possibly the liver is concerned in the process. W. D. H.

Influence of Irritants on Milk Secretion. GUSTAV FINGERLING (*J. Landw.*, 1903, **51**, 287—288).—Malt germs (added to a food consisting of straw, starch, and oil) affected the quality but not the yield of milk. Fenugreek had no effect, whilst hay-distillate and fenchel increased the yield. In every case (except with fenugreek), the milk fat was increased.

When the animals (sheep and goats) were fed with hay, the addition of these substances had no effect. N. H. J. M.

Minimal Intake and Excretion of Potassium in the Urine. E. MAUREL (*Compt. rend. Soc. Biol.*, 1903, **55**, 1282—1284. Compare Abstr., 1901, ii, 565).—In the adult on maintenance diet, 0·06 gram of potassium per kilo. of body-weight is sufficient. 0·07 is sufficient during growth, and in the adult during convalescence from disease.

W. D. H.

The Minimal Excretion of Nitrogen. E. MAUREL (*Compt. rend. Soc. Biol.*, 1903, **55**, 1279—1281).—The experiments made on the author's person with insufficient nutriment confirm those of Burt, Bouchard, and von Noorden. However small the quantity of nitrogen taken in, the excretion never falls below from 0·08 to 0·09 gram per kilo. of body-weight.

W. D. H.

Influence of Diet, Muscular Exertion, and Loss of Sleep on the Formation of Uric Acid in Man. HENRY C. SHERMAN (*J. Amer. Chem. Soc.*, 1903, **25**, 1159—1166).—Both with professional athletes and with the subject of sedentary habits, the elimination of uric acid is primarily dependent on the food consumed. Whilst very small changes resulted from large variations in the amount of a bread-and-milk diet, the elimination of uric acid was mainly determined by the quantities of meat products consumed. Prolonged muscular exertion in well-trained athletes had little influence on the formation and elimination of uric acid. Marked loss of sleep had no apparent influence on the amount of uric acid eliminated.

A. McK.

Relation between Uric Acid Excretion and White Corpuscles. O. K. WILLIAMSON (*Trans. Path. Soc. London*, 1903, **54**, 265—285).—A number of cases of disease are described in which, on the whole, there is a parallelism between the excretion of uric acid (and in some cases of phosphoric acid also) and the amount of breaking down of the colourless corpuscles of the blood.

W. D. H.

Absence of Neutral Sulphur in Normal Urine. L. MONFET (*Compt. rend. Soc. Biol.*, 1903, **55**, 1169—1171).—The so-called neutral sulphur of urine is only sulphuric acid united to the phenol group, which is stable in the presence of hydrochloric acid. A litre of urine contains about a gram of ethereal sulphates; of this total, the indole-scatole group accounts for one-third, and the phenol-cresol group for the remainder. Potassium indoxyl sulphate is a normal constituent of urine; whereas indican is abnormal, and is spoken of as a gluco-derivative.

W. D. H.

Lipolytic Power of Icteric Urine. CHARLES GARNIER (*Compt. rend. Soc. Biol.*, 1903, **55**, 1180—1181).—Icteric urine containing bile pigments hydrolyses monobutyrin, but normal urine does not. This action is not destroyed by boiling, but is due to the presence of certain biliary constituents. Bile has the same power, which is also not lost after boiling. The bile salts do not possess the property, but possibly the bile pigments are the substances to which it is due.

W. D. H.

Urinary Indican. L. Monfet (*Compt. rend. Soc. Biol.*, 1903, **55**, 1211—1213).—Urinary indican is a gluco-compound. It appears in the urine when the combination with sulphuric acid is insufficient. Its formation is an additional act of defence against indole poisoning.
W. D. H.

Urinary Indoxyl. C. Hervieux (*Compt. rend. Soc. Biol.* 1903, **55**, 1294—1295).—A criticism of Monfet's method of estimating indican, and a restatement of the author's view of the two ways in which indoxyl occurs in the urine, namely, as a sulpho- and as a gluco-compound.
W. D. H.

Ehrlich's Diazo-reaction in Urine. L. Monfet (*Compt. rend. Soc. Biol.* 1903, **55**, 1275—1277).—Whenever this reaction is positive in urine, that fluid contains excess of conjugated derivatives of indole and scatole which indicates excess of putrefactive processes.
W. D. H.

Action of Saline Purgatives. John Bruce MacCallum (*Amer. J. Physiol.*, 1903, **10**, 101—110).—A fuller account of observations already published (Abstr., 1903, ii, 742). W. D. H.

Behaviour of Human Semen towards Solutions of Mercuric Chloride. Nazareno Tarugi (*Chem. Centr.*, 1903, ii, 1077—1078; from *Boll. Chim. Farm.*, **42**, 577—579).—When a 1 per cent. solution of mercuric chloride is added to human semen, a white, flocculent precipitate is formed, which settles after a time and leaves a perfectly clear supernatant liquid. The whole of the spermine is contained in this precipitate, together with other substances which do not interfere, however, with the spermine phosphate test. When ammonium phosphate is added to a solution of the precipitate in ammonia of sp. gr. 0·96, spermine phosphate is precipitated; a solution of the precipitate in a 35 per cent. solution of acetic acid gives the biuret reaction, and also forms precipitates with phosphomolybdic acid, phosphotungstic acid, a saturated solution of sodium chloride, and a solution of iodine in potassium iodide E. W. W.

Cerebrospinal Fluid. Isador H. Coriat (*Amer. J. Physiol.*, 1903, **10**, 111—114).—An analysis of the fluid from a case of hydrocephalus. The freezing point was $-0·65°$, and the relation $\Delta : NaCl = 0·97$. The total proteid was 1·18 gram per litre, and consisted of globulin. Catechol and choline were absent; sugar was present.
W. D. H.

Production of Choline in the Cerebrospinal Fluid in Cases of Epilepsy and Nervous Diseases. Julius Donath (*Zeit. physiol. Chem.*, 1903, **39**, 526—544. Compare Mott and Halliburton, Abstr., 1901, ii, 260, 463; Zdarek, Abstr., 1902, ii, 528).—Choline has been detected in the cerebrospinal fluid taken from epileptic patients, and this is regarded as the actual poison causing the fits.

It is found that by intracerebral application of choline or of neurine, severe paralytic effects are produced.

Other substances found in the cerebrospinal fluid are sodium chloride, potassium and ammonium salts, and phosphates. In two cases, no ammonia was found, and in two other instances lecithin was observed. A substance with reducing properties, probably dextrose, is also present. Choline cannot be detected in the urine of animals to whom it has been administered either intracerebrally or intravenously. It appears to be readily oxidised.

The choline was always isolated in the form of its platinichloride. For this purpose, the liquid is evaporated to dryness on the water-bath and then extracted with 100 per cent. alcohol, when the alkali chlorides remain undissolved and only choline hydrochloride goes into solution. The platinichloride is obtained by the addition of an alcoholic solution of platinic chloride to the solution. It is characterised by being readily soluble in water and by its crystallographic form. J. J. S.

Cholesteatoma of the Brain. H. Morley Fletcher (*Trans. Path. Soc. London*, 1903, **54**, 308—310).—A case of this rare form of brain tumour is described. The cholesterol appears to originate from the breakdown of cells, but the endothetial origin of the cells is doubtful. W. D. H.

Proteolytic Ferment in the Blood in Myelogenic Leucæmia. O. Schumm (*Beitr. chem. Physiol. Path.*, 1903, **4**, 442—452. Compare Abstr., 1903, ii, 731).—The presence of proteoses, peptone (in Kühne's sense), leucine and tyrosine is described in the blood of two cases of this disease; this is attributed to the presence of a proteolytic ferment in that fluid. Further investigation of the bone marrow in such cases is necessary. W. D. H.

Multiple Myeloma and Albumosuria. F. Parkes Weber (*J. Pathol. Bacteriol.*, 1903, **9**, 172—191).—Details of a case of bone disease are given, in which the albumose called Bence-Jones' albumin occurred in the urine. References and short details are also given of 39 hitherto recorded cases of the same condition.

W. D. H.

Albumoses in Tubercular Sputum. Oscar Simon (*Chem. Centr.*, 1903, ii, 897; from *Arch. exp. Path. Pharm.*, **49**, 449—456).—Kühne showed that Koch's tuberculin contained a mixture of albumoses precipitable by acetic acid. This acro-albumose is regarded as identical with the proteid found in exudations by Umber and Stähelin. It is, however, not found in tubercular sputum. The albumoses present are different; they arise as the result of microbic and autolytic processes. A method of isolating them is described; the alcoholic filtrate is stated to contain a peptone-like substance. They give the ordinary proteid tests, and contain loosely-bound sulphur. Injected into healthy animals, they cause rise of body temperature, whilst in tuberculous animals they produce high fever.

W. D. H.

Lime Deposits in the Kidneys. Edwin Beer (*J. Pathol. Bacteriol.*, 1903, **9**, 225—233).—Calcareous deposits in the kidneys, especially after the age of 24, are very common, even when no bone disease exists. The majority cannot be classed as metastatic, and are accompanied with chronic interstitial nephritis. W. D. H.

Proteids of the Body during Inanition. Ferdinand Blumenthal (*Chem. Centr.*, 1903, ii, 842; from *Deutsch. med. Woch.*, **29**, 437—439).—During inanition and in phloridzin diabetes, the blood proteid loses its carbohydrate group. A contrast is drawn between this and the nucleins, which are regarded as of little use in nutrition, but they favour oxidation processes; they contain iron and phosphorus, and are important for the vital functions. The purine bases they contain are excreted, but the pentose group is incompletely used. W. D. H.

Action of Lead, Mercury, Phosphorus, Iron, and Quinine on the Bone-marrow of Rabbits. Ralph Stockman and Francis J. Charteris (*J. Pathol. Bacteriol.*, 1903, **9**, 202—208).—Chronic lead poisoning causes marked anæmia; the bone-marrow, after increased activity, shows gelatinous degeneration and complete atrophy. The results with mercury are very similar, but the degeneration occurs very early. Phosphorus produces the same result, and also fatty degeneration in other tissues. Iron has no such effect, but promotes the formation of new blood corpuscles. Quinine has no effect on the marrow. W. D. H.

Action of Various Monohydric Alcohols on Ciliated Epithelium and Motor Nerve Fibres. Hans Breyer (*Pflüger's Archiv*, 1903, **99**, 481—512).—The main effect of alcohols on these structures is first depression, then stimulation, and finally depression again. The depression increases with the concentration of the alcohol, and with its molecular weight. Cilia continue working much longer in a decinormal solution of alcohol than in saline solution. Extensive references to the whole alcohol question are given. W. D. H.

Action of Choline, Neurine, Muscarine, and Betaine on Isolated Nerve and Heart. Augustus D. Waller and S. C. M. Sowton (*Proc. Roy. Soc.*, 1903, **72**, 320—345).—The toxicity of these ptomaines decreases in the following order: neurine, muscarine, choline, and betaine. The effect on nerve is to lessen or abolish the action current: the effect on the heart is diastolic arrest; this is counteracted by atropine. W. D. H.

Physiological Action of Betaine extracted from Raw Beet-sugar. Augustus D. Waller and R. H. Aders Plimmer (*Proc. Roy. Soc.*, 1903, **72**, 345—352).—Betaine is present in raw beet-sugar in considerable quantities (3·75 per 1000). In view of the work of Waller and Sowton (see preceding abstract), it can no longer be considered an inert substance. W. D. H.

Toxicity of Benzene and its Homologues. Allyre Chassevant and M. Garnier (*Compt. rend. Soc. Biol.*, 1903, 55, 1255—1257).—The toxicity on guinea-pigs of various aromatic hydrocarbons is given in tabular form. The action depends on the molecular weight, the number of substitutions, and the position of the substituted radicles. Mono-substitution products are the most toxic.
W. D. H.

Strychnine and Persodine. G. Bufalini (*L'Orosi*, 1902, 25, 332—337).—Persodine, which is a special preparation composed of a mixture of the persulphates of sodium and ammonium, acts as an antidote in cases of strychnine poisoning. The strychnine is converted by this reagent into either oxystrychnine or strychnol, which are both products of much less toxicity than strychnine itself. The author gives details of a number of experiments on the effect of persodine on rabbits to which strychnine had been administered. T. H. P.

Physiological Action of Apocodeine. Walter E. Dixon (*J. Physiol.*, 1903, 30, 97—131).—Apocodeine paralyses nerve cells like nicotine, but without any initial stimulation. After the paralysis produced by apocodeine, nicotine is without effect, but adrenalin still acts typically. In a series of four opium alkaloids, the purgative action varies directly with their paralytic effect on sympathetic ganglia. Larger amounts of apocodeine act like curare on the voluntary muscles, and like atropine on the heart. With still larger doses, paralysis of vaso-motor nerve endings is produced; under these circumstances, pilocarpin, physostigmin, and adrenalin have no effect on blood vessels, whilst barium salts and digitalis still constrict them; the former three drugs, therefore, act on nerve endings, and the latter two on muscular fibres. The accelerator nerves of the heart are paralysed; caffeine and aconitine, however, subsequently quicken the heart, and so act on muscle. Both motor and inhibitory nerves of the intestines are paralysed, but the terminals of the hypogastrics are not affected. W. D. H.

Physiological Action of Atropine and the Hyoscyamines. Arthur R. Cushny (*J. Physiol.*, 1903, 30, 176—194).—A full description of experiments of which a preliminary account has already appeared. W. D. H.

Action of Extracts of Nervous Tissues and Blood. Swale Vincent and Wilhelm Cramer (*J. Physiol.*, 1903, 30, 143—154).—A full description of experiments of which a preliminary account has already appeared (Abstr., 1903, ii, 673). W. D. H.

Action of Tissue Extracts on Protoplasm. J. W. Scott-Macfie (*J. Physiol.*, 1903, 30, 264—269).—Extracts of suprarenal, pituitary thymus, brain, testis, and other organs have no action on protoplasmic structures when applied directly to them. Some rather alter the rate of ciliary movement, but there is no specific action; the activity of leucocytes is not altered at all; neither is the beat of the embryonic heart. W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Thermophile Bacteria from various Foods and Milk and the Products formed when these Bacteria are Cultivated in Media containing Carbohydrates. FRANZ SCHARDINGER (*Zeit. Nahr. Genussm.*, 1903, 6, 865—880).—Experiments were carried out with two groups of bacteria, one group being cultivated at temperatures varying from 15° to 55°, and the other from 37° to 66°. The species belonging to group I, when grown upon media containing starch-paste, formed a crystallisable dextrin, $C_6H_{10}O_5,3H_2O$ (compare Abstr., 1891, 659), together with acetic and *l*-lactic acids. The anærobic bacteria belonging to this group produced a small quantity of butyric acid. The bacteria included in Group II were obtained from milk which had been kept at a temperature of 60° for 24 hours. With starch-paste, these bacteria formed acetic, butyric, and *l*-lactic acids. The butyric acid was only present in small quantity. Fermentation experiments with the anærobic bacteria showed that no alcohol was produced, although there was a considerable evolution of gas. In this case, butyric and inactive lactic acids were formed. W. P. S.

Reduction of Sulphates by Bacteria. A. VAN DELDEN (*Centr. Bakt. Par.*, 1903, ii, 11, 81—94).—The optimum temperature for *Microspira desulfuricans* is between 25° and 30°, but even at 37° hydrogen sulphide is produced abundantly. The organic matters usually present in polluted waters are suitable for the reducing organism. Lactates, malates, and succinates are the most suitable organic salts, whilst nitrogen is assimilated in the form of asparagine, peptone, and ammonium salts. Nitrates hinder the reduction. Sulphate reduction takes place in canal and river water after a little potassium phosphate, sodium lactate, and asparagine have been added; it is suggested that the reduction might be utilised, in conjunction with an iodometric titration, for estimating the amount of sulphate present in water.

Cultivations in gelatin containing hydrogen sulphide produced sulphur at the surface to a depth of about 1·5 cm.

A bacterium was isolated which does not reduce sulphates, but reduces sulphites and thiosulphates, and, with limited access of oxygen, oxidises the hydrogen sulphide to sulphur. The bacterium resembles *Microspira desulfuricans* and differs from *Bacterium hydrosulfureum pontican* in not growing in air.

Experiments with sea water, to which mineral and organic substances were added, showed that reduction of sulphates sometimes occurred, but not always. Inoculation with sea sand and addition of sodium sulphite generally resulted in reduction, whilst inoculation with mud obtained at low tide at a depth of 10 cm. invariably induced reduction. Sea water can be entirely freed from sulphates when sufficient organic matter is added. N. H. J. M.

Reduction of Sulphates by Bacteria. A. VAN DELDEN (*Centr. Bakt. Par.*, 1903, 11, 113—119).—*Microspira æstuarii* was cultivated in various solutions containing magnesium sulphate and suitable nutrient material and the amount of hydrogen sulphide produced was estimated. The effect obtained by *M. desulfuricans* is similar to that with *M. æstuarii*. Experiments are described where both organisms were grown in aqueous solutions containing sodium chloride, sodium phosphate, ammonium chloride, sodium lactate and magnesium sulphate—the amount of carbon dioxide and hydrogen sulphide produced being estimated in both cases. In other experiments, sodium malate was substituted for sodium lactate.

The reduction of sulphates by *M. desulfuricans* and *M. æstuarii* is a process which is possible, under anærobic conditions, only in a medium which contains, in addition to sulphates, some suitable organic nutrient material. Sulphate reduction, like denitrification, can be effected in the absence of free oxygen. A. McK.

Influence of Carbohydrates on the Relations of the Gas-exchange in Yeast. [MDLLES.] E. KOLLEGORSKY and O. ZASSOUCHINE (*Centr. Bakt. Par.*, 1903, ii, 11, 95—105).—The relation CO_2/O_2, when dextrose and lævulose are present, first increases, then diminishes, and again increases, always remaining more than 1. Maltose gave similar results. In presence of sucrose, the relation, which is at first less than 1, increases continuously.

Cultures of *Saccharomyces cerevisiæ* containing glycerol gave a relation CO_2/O_2 above 1; whilst in cultures of *Schizosaccharomyces Pombe* the relation was below 1. With mannitol, the relation CO_2/O_2 was below 1. N. H. J. M.

Sterilisation of Drinking Water by Chlorine and Bromine. FRANZ BALLNER (*Arch. Hygiene*, 1903, 48, 140—178).—Experiments are described where cholera germs were added to drinking water, which was then treated with a dilute acidified solution of bleaching powder; the cholera germs were entirely destroyed. Other experiments with various pathogenic micro-organisms are fully described. A. McK.

Influence of Light on Organic Substances, with Special Reference to the Automatic Purification of Streams. RUDOLF RAPP (*Arch. Hygiene*, 1903, 48, 179—205).—The influence of sunlight on oxalic acid solutions of varying concentrations was examined. Air, oxygen, and hydrogen were respectively passed through the solutions, which were exposed in vessels of different shapes, and the amount of carbon dioxide formed was estimated. Whilst the influence of sodium phosphate, hydrochloric, sulphuric, and phosphoric acids on the decomposition was slight, the addition of normal salts, such as sodium chloride, potassium nitrate, &c., considerably increased the amount of oxidation. When the oxalic acid solutions were made turbid by the addition of a little milk, the oxidation was lessened. Sterilised solutions of aspartic acid, uric acid, hippuric acid, carbamide, peptone, tyrosine, leucine, cresol, and phenol, in the presence of air, suffered alteration in sunlight, whilst lactic acid, glycine, and creatine were unaltered. Hippuric acid, peptone, cresol, phenol, and leucine in an atmosphere of hydrogen, were also affected by light.

Experiments with algæ in water contaminated with *Bacillus coli* indicated the function of the former in connection with the automatic purification of streams, when the action of sunlight favours the destruction of bacteria and the growth of organisms containing chlorophyll. A. McK.

[Action of Antiseptic and Insecticidal Agents.] MARCELLIN P. E. BERTHELOT (*Compt. rend.*, 1903, **137**, 953—956).—The principal antiseptic and insecticidal agents fall into three main classes; mineral poisons, which form compounds inimical to life; asphyxiating vapours, such as carbon disulphide, hydrocyanic acid, &c.; phenols, and compounds capable of exerting a catalytic action. To the last group belong the terpenes, camphor, aldehydes, &c. Naphthalene, which is commonly regarded as a powerful insecticide, is almost without action. C. H. D.

Influence of Mineral Food in the Production of Sexes in Diœcious Plants. ÉMILE LAURENT (*Compt. rend.*, 1903, **137**, 689—692). —The results of an experiment with spinach, in which exclusively male and female plants were produced, showed that nitrogenous manure and lime both increased the proportion of male plants, whilst potassium and phosphoric acid were favourable to the production of female plants. In absence of any manure, the numbers were about equal (50·7 : 49·3). Small seeds nearly always produced more male plants than larger seeds.

Seeds obtained under the influence of excessive amounts of nitrogen yielded more female than male plants, whilst excesses of potassium, calcium, and phosphoric acid predispose the seeds to yield an excess of male plants.

No effect was observed in the case of hemp and *Mercurialis annua.* N. H. J. M.

Anærobic Changes in Seeds in Potassium Nitrate Solutions. A. J. NABOKICH (*Chem. Centr.*, 1903, ii, 1012; from *Ber. bot. Ges.*, **21**, 398—403).—When peas are immersed in water, a 1 per cent. solution of dextrose, a 0·5 per cent. solution of potassium nitrate, or a 1 per cent. solution of peptone, the ratio of the alcohol to the carbon dioxide formed by a process of intramolecular respiration is almost constant. Respiration takes place most vigorously in peptone and sugar solutions; potassium nitrate solution reduces it to half that observed in water, and after 8 to 10 days it entirely ceases. Considerable differences in the quantities of the so-called non-volatile acids are found, but they can scarcely be ascribed directly to the fermentation process. The combustion of the alcohol by the oxygen of the nitrate is not possible in the case of cultures which lived 7 days. Small quantities of nitrogen trioxide were detected, and this doubtless determines the end of the fermentation. It is doubtful, however, whether the increase in the quantity of total acid observed in cultures after 14 days is to be ascribed to the presence of nitrous acid. E. W. W.

The Behaviour of Fat in Germinating Oil-containing Seeds. Otto von Fürth (*Beitr. chem. Physiol. Path.*, 1903, 4, 430—437).—In certain stages there is a breaking up of fat into glycerol and fatty acid. The main thesis of the paper is, however, the probable transformation of fat into carbohydrate, and the possible intermediate stages in the process. W. D. H.

Normal and Intramolecular Respiration of Chlorothecium Saccharophilum. Wladimir Palladin (*Cęntr. Bakt. Par.*, 1903, **11**, 146—153).—*Chlorothecium saccharophilum* was cultivated in an aqueous solution containing ammonium phosphate, potassium phosphate, magnesium sulphate, calcium chloride, and a trace of ferric chloride, to which dextrose, sucrose, raffinose, and mannitol were respectively added. The amount of carbon dioxide evolved during the growth of the alga in air or in absence of air was estimated; the respiration coefficient ($CO_2 : O_2$) was also determined. *Chlorothecium saccharophilum* is a typical ærobic organism; its respiration coefficient is smaller than 1; its growth is possible only in presence of oxygen. In the absence of an atmosphere of oxygen, the alga continues to evolve carbon dioxide; after the cessation of this evolution, the alga is still alive, since, when brought again into air, the carbon dioxide evolution again begins.

The formation of carbon dioxide in an atmosphere free from oxygen is not regarded, in the case of this alga, as a typical fermentation, but rather as intramolecular respiration. A. McK.

Transpiration in Green Leaves when the Upper or Under Surfaces are Exposed to Light. Ed. Griffon (*Compt. rend.*, 1903, **137**, 529—531. Compare Abstr., 1902, ii, 624).—Transpiration diminishes when leaves are reversed, owing partly to the rate at which water is given off being greater than that at which it is renewed. In enclosed leaves, transpiration is diminished, but it is greater when the under sides are exposed to light than when the upper sides are exposed. In the case of cut leaves (enclosed), transpiration is less when the under sides are exposed to light.

Whilst the pallisade tissue promotes chlorophyllous assimilation, it tends to reduce, and also to control, transpiration in leaves exposed to light. N. H. J. M.

Effect of Temperature on the Assimilation of Carbon Dioxide by Leaves. Gabrielle L. C. Matthaei (*Proc. Roy. Soc.*, 1903, **72**, 355—356).—The assimilation of carbon dioxide by single cherry laurel leaves was determined at temperatures varying from – 6° to 45°. There are numerous facts to be taken into account, such as amount of illumination, season of the year, &c. There is a maximum assimilation specific to each temperature, but at high temperatures rapid decline of vitality rendered approximate values alone possible. During assimilation, the temperature of the leaf rises. W. D. H.

Cyanogenesis in Plants. Part III. Phaseolunatin, the Cyanogenetic Glucoside of Phaseolus lunatus. Wyndham R. Dunstan and Thomas A. Henry (*Proc. Roy. Soc.*, 1903, 72, 285—294. Compare Abstr., 1902, ii, 578).—When the finely-ground beans from wild *Phaseolus lunatus* are exhausted with cold methylated alcohol, a glucoside *phaseolunatin*, $C_{10}H_{17}O_6N$, is obtained which, on recrystallisation from water, forms spreading rosettes of colourless needles, melting at 141° and having $[\alpha]_D - 26{\cdot}2°$.

When the glucoside is hydrolysed by acids, dextrose, acetone, and hydrogen cyanide are produced, the amount of dextrose varying in four experiments from 64·6—70·4 per cent. The equation $C_{10}H_{17}O_6N + H_2O = C_6H_{12}O_6 + COMe_2 + HCN$ requires the production of 72·5 per cent. of dextrose.

Hydrolysis of phaseolunatin by alkali hydroxides leads to the production of ammonia and the formation of a new acid glucoside, *phaseolunatinic acid.* The latter substance, when hydrolysed by acids, yields α-hydroxy*iso*butyric acid and dextrose. Hence phaseolunatin is the dextrose ether of acetone cyanhydrin, and the changes occurring in the above hydrolyses are represented as follows:

(1) $CN{\cdot}CMe_2{\cdot}O{\cdot}C_6H_{11}O_5 + 2H_2O = CO_2H{\cdot}CMe_2{\cdot}O{\cdot}C_6H_{11}O_5 + NH_3$.

(2) $CO_2H{\cdot}CMe_2{\cdot}O{\cdot}C_6H_{11}O_5 + H_2O = CO_2H{\cdot}CMe_2{\cdot}OH + C_6H_{12}O_6$.

Evidence of the existence of phaseolunatin in Rangoon beans has also been obtained.

When the powdered beans from the wild *P. lunatus* are moistened with cold water, the odour of hydrogen cyanide is perceived. It can be shown that the hydrogen cyanide does not exist as such in the plant, but is derived from the glucoside by the action of an enzyme. This enzyme has been isolated in the usual manner, and is probably emulsin.

The seed obtained from *P. lunatus* under cultivation does not contain phaseolunatin, and the reason for this is probably the stimulus to metabolism resulting from improved nutrition and environment.

J. C. P.

Salicylic Acid a Normal Constituent of Wild Cherries. Charles J. A. Jablin-Gonnet (*Ann. chim. anal.*, 1903, 8, 371—372).—The author states that the juice of wild cherries gives the salicylic acid reaction, and contains as much as 20 or 30 milligrams of this substance per litre. As this juice is frequently used to impart colour to other fruit juices, the presence of mere traces of salicylic acid need not necessarily be looked on as a wilful addition.

L. de K.

Occurrence of Salicylic Acid in Berries and Stone Fruits. Paul Süss (*Chem. Centr.*, 1903, ii, 841; from *Verh. Vers. Deutsch. Naturf. Aertze*, 1902, ii, 102—104).—The author examined strawberry juice and strawberry pulp from the various kinds of strawberries growing in the neighbourhood of Dresden, and in every case a reaction for salicylic acid was obtained. One litre of the juice contained from 2 to 3 milligrams of this acid, which, therefore, may be regarded as a normal constituent. This, however, does not interfere much with the testing for salicylic acid added as a preservative, because for this purpose a much larger amount is required, and this may be isolated by a direct extraction with ether, &c., and estimated colorimetrically.

In the juice of red currants, gooseberries, blackberries, raspberries, cranberries, cherries, plums, greengages, apples, and pears, salicylic acid could not be detected; neither was it present in the oil extracted from raspberry stones by means of ether. L. DE K.

Natural Occurrence of Salicylic Acid in Berries. FRANZ UTZ (*Chem. Centr.*, 1903, ii, 841; from *Oesterr. Chem. Zeit.*, 6, 385—386).—Strawberries and raspberries gave an unmistakable reaction for salicylic acid when tested by Windisch's process (*ibid.*, ii, 124), but no sign of it was shown by red currants, gooseberries, or bilberries. The author agrees with Windisch that the bulk of the salicylic acid in strawberries and raspberries is present as an ester. As Traphagen and Burke (Abstr., 1903, ii, 388) have found salicylic acid in most other fruits, the author believes that this is due to local influences.

L. DE K.

Saponins of the Seeds of Entada Scandens. LEOPOLD ROSENTHALER (*Arch. Pharm.*, 1903, **241**, 614—616).—The powdered seeds were freed from fat with ether and then extracted with alcohol; the alcoholic extract was cooled and mixed with ether. The substance which separated was dissolved in water and treated with aqueous barium hydroxide. A small precipitate formed; this was suspended in water and decomposed with carbon dioxide; the solution, filtered from the barium carbonate that had formed, left on evaporation a small amount of a saponin, *a*, which formed a lather with water and was decomposed by boiling with dilute acids, yielding an insoluble sapogenin and a solution which reduced Fehling's solution.

From the barium hydroxide solution, another substance, *entada saponin*-b, which yielded a lather with water, was obtained and purified. This was amorphous and contained ash, 1·6; C, 49·7; H, 6·1 per cent. ($C_{15}H_{22}O_{10}$). It forms a *triacetyl* derivative, and it is hydrolysed by 10 per cent. hydrochloric acid, yielding a sugar (galactose), the phenylhydrazone of which melts at 194°, a crystalline *sapogenin*, $C_{30}H_{50}O_6$, and an amorphous substance. C. F. B.

Xanthine Derivatives from Plants. TH. WEEVERS and (Mrs.) C. J. WEEVERS-DE GRAAFF (*Proc. K. Akad. Wetensch. Amsterdam*, 1903, 6, 203—208).—The following plants, *Coffea arabica*, *C. liberica*, *C. stenophylla*, *Thea assamica*, *T. sinensis*, *Kola acuminata*, *Theobroma cacao*, were examined for caffeine and theobromine at different stages of their development, with the view of determining whether those substances were intermediate or final products of the internal mutation of the plants.

Caffeine and theobromine are present in all the young parts of the plants which grow above ground, even when the plants spring from old parts quite devoid of these substances; during the initial growth caffeine or theobromine is always formed, but the amount diminishes during further growth of the plant, until finally, in the full-grown plant, no caffeine or theobromine is present. A. McK.

Occurrence of Invertase in Plants. JOSEPH H. KASTLE and MARY E. CLARK (*Amer. Chem. J.*, 1903, **30**, 422—427).—Nineteen species of plants, representing fourteen different families, have been examined for the presence of invertase. The results of the investigation are collected in tabular form. They show that invertase is a ferment of wide, if not universal occurrence in the vegetable kingdom, and that in the several organs of plants it is more frequently present than diastase and occurs abundantly in the leaves. It has been found to be present in the growing tubers of the potato and artichoke and in the sprouts of the potato in larger amount than either inulase or diastase. Invertase is not confined to those plants which store up sucrose as the characteristic reserve material, but is found abundantly in those plants which store up starch and inulin, and, moreover, in the very organs which accumulate these reserve materials. E. G.

The Sap of Asclepias Syriaca. J. MAREK (*J. pr. Chem.*, 1903, [ii], **68**, 385—416).—The sap of *Asclepias syriaca* has a sp. gr. 1·0280—1·0352 at 15°/15°, is slightly acid towards litmus, has a sharp flavour, and an odour resembling that of the flowers, becomes viscous on drying, and coagulates slowly at 38°, rapidly at 90°. On evaporation, the sap leaves a solid residue (16·23—17·73 per cent.), which, on ignition, smells of caoutchouc, evolves inflammable gases, and leaves an ash (1·24 per cent.) containing chlorides, sulphates, phosphates, carbonates, and silicates of sodium, potassium, calcium, magnesium, iron, and aluminium.

The sap contains 0·25 per cent. of nitrogen, equivalent to 1·56 per cent. of albumin, and reduces Fehling's solution equivalent to 0·82 per cent. of glucose. On addition of water, the sap yields a white, curdy precipitate (10·76 per cent.), which consists of caoutchouc (1·46 per cent.) and a mixture of esters of butyric acid, which could not be completely purified. The results of analysis point to the presence of three esters, $C_{24}H_{39}O\cdot C_4H_7O$, $C_{26}H_{43}O\cdot C_4H_7O$ or $C_{25}H_{41}O\cdot C_4H_7O$, and $C_{20}H_{33}O\cdot C_4H_7O$ or $C_{19}H_{31}O\cdot C_4H_7O$, the first two of which melt respectively at 40—45°, and 55—60°; on hydrolysis, these esters yield butyric acid and hydroxylic compounds which give mixtures of benzoyl derivatives. G. Y.

Coca-Leaves. C. HARTWICH (*Arch. Pharm.*, 1903, **241**, 617—630). —A paper chiefly of botanical interest. The percentage of alkaloids in the leaves of several varieties of *Erythroxylum Coca* was determined with the following results. Typical: from Cuzko, 0·91; Huanta, 0·86; Ceylon, 0·83. Var. *Spruceanum*: from Truxillo, 0·78; Java, 1·22. The numbers refer to the dry leaves, which originally contained 10—15 per cent. of water. C. F. B.

Composition and Pharmacological Action of Cranberry Leaves. ARTH. KANGER (*Chem. Centr.*, 1903, ii, 893; from *Arch. exp. Path. Pharm.*, 50, 46—75).—This investigation arose from the statement that cranberry leaves have a powerful anti-rheumatic action. The leaves contain proteid, traces of tartaric acid, abundance of quinic acid, quinol, arbutin, and a tannic acid having the formula $C_{28}H_{29}O_{10}$; the latter yields quinol when fused with potash and subjected to dry distillation. In the aqueous extract of the leaves, gallic acid, ellagic acid, ericinole, and ericolin were also found. The gallic and ellagic acids are not present as such in the leaves, but arise from the decomposition of tannic acid. The fruit contains much free benzoic acid, and the flowers, quinol. In large doses, the leaves act as a diuretic and are toxic; this is due to quinol, which is also an antiseptic. Arbutin and quinol pass in part through the body unchanged and appear in the urine. W. D. H.

Examination and Evaluation of Horse-chestnuts. ERNST LAVES (*Chem. Centr.*, 1903, ii, 1133—1134; from *Verh. Vers. Deutsch. Naturf. Aerzte.*, 1902, ii, II, 660—664).—Dried horse-chestnuts contain on an average 8·5 per cent. of nitrogenous substances 7·0 of crude fat, 77·2 of non-nitrogenous extractive substances, and 4·7 of fibrous material, and yield 2·6 per cent. of ash. The peeled nuts contain only 1·2 per cent. of fibrous matter. The ash is alkaline and contains 26 per cent. of P_2O_5, almost wholly combined in inorganic compounds, and 56 per cent. of K_2O. The nitrogenous substances are soluble for the most part in water or in a solution of sodium chloride. The crude fat, which also contains the bitter principle of the chestnut, may be separated into a brown resin and a green, tasteless oil by means of light petroleum. The former is almost insoluble in alkalis. The seeds contain 6 per cent. of the oil, which is a non-drying oil and has an iodine number 108. The resin reduces Fehling's solution and forms dark red and green colorations with Millon's reagent and ferric chloride respectively; it probably contains æsculetin. The non-nitrogenous substances consist of 50 per cent. of insoluble carbohydrates, 14 of sucrose, 13 of glucosides, and 0·2 of tannin. *Aphrodaescin*, $C_{52}H_{82}O_{23}$, is the principal glucoside and forms an amorphous substance which has the same physiological action as a saponine, but its chemical behaviour differs in several respects from those of members of the saponin group. The alcoholic extract of the nuts (Flügge, Ger. Pat. 114845) contains about 36 per cent. of glucosides, 4 of resin (bitter principle), and 6 of fat, and is useful for external application in cases of rheumatism and affections of the skin. The carbohydrates of the glucosides have been fermented; 100 kilograms of seed yielded 25 litres of spirit, the aroma of which resembled that of corn brandy, but was much stronger. The method described in the patent also yields a fatty, nitrogenous fodder which does not contain bitter principles, and a deposit containing phosphoric acid, potassium compounds, and nitrogenous substances. E. W. W.

Fatty Substances and Acidity of Flours. BALLAND (*Compt. rend.*, 1903, 137, 724—725).—The fatty substance of fresh flour consists of a very fluid oil and a mixture of solid fatty acids. The oil gradually diminishes in quantity and finally disappears, whilst the fatty acids remain. This change enables old flour to be distinguished from new flour. The fatty acids themselves disappear in time and will not be found in very old flour. Hard wheat yields flour containing more acids than soft wheat. The latter should therefore be selected if the flour has to be kept for a long time. N. H. J. M.

Some Ancient Breads. Léon Lindet (*Compt. rend.*, 1903, **137**, 664—666).—Fragments of bread discovered at Pompeii present the appearance of porous charcoal and contain 2·65 per cent. of nitrogen combined with carbon, traces of humous matter yielding acetic acid on dry distillation, and chlorine.

The bread obtained from lake dwellings contains 2·46—4·69 per cent. of nitrogen combined with carbon; starch grains and fragments of the epidermis of the barley can be detected in some specimens.

Bread from the Egyptian tombs is in an excellent state of preservation and contains 11·25 to 11·44 per cent. of nitrogenous matter, and 65·2 to 68·0 per cent. of starch, of which 20·4 per cent. is in the form of soluble starch and dextrin, the remainder as swollen starch; chlorides and nitrates are also present.

In a specimen of fossil bread from Aosta a few wheaten starch grains can be detected. M. A. W.

Rice Oil. Charles A. Browne, jun. (*J. Amer. Chem. Soc.*, 1903, **25**, 948—954).—The constants of a specimen of rice oil are given; the acid number was 166·2, corresponding with 83·5 per cent. of free oleic acid. The oil from fresh rice bran was only slightly acid, but, when the bran was left for some considerable time, a rapid development of acidity took place in the oil, and this may be due either to oxidation or to the action of lipase. Experiments are described which show that a fat-splitting enzyme is present in rice bran. Feeding experiments were also made as to the digestibility of rice oil and the effect of digestion on the composition of rice oil. A. McK.

Sesamé Oil. Hans Kreis (*Chem. Zeit.*, 1903, **27**, 1030—1031).—Those samples of sesamé oil which yield azo-dyes become emerald-green on being shaken with nitric acid (1 : 4), whilst other samples, which do not yield azo-dyes, become orange-red with nitric acid. Indications were obtained of the presence in sesamé oil of a small amount of a phenol (which was not isolated).

When sesamé oil is shaken with 75 per cent. sulphuric acid and a little hydrogen peroxide, an intense olive-green coloration appears, which changes to a bright yellow with green fluorescence on diluting the solution with water. A. McK.

Composition of Milk. H. Droop Richmond (*Analyst*, 1903, **28**, 289—292).—The average monthly composition of 12,914 samples of milk analysed during 1902 is given. The average percentage of fat for the year was 3·82. One hundred and ninety-seven samples from consecutive milkings of one cow were examined. The solids-not-fat varied but little, whilst the fat showed considerable variations. A low percentage of fat, however, was always followed at the next milking by a quantity well above the average.

With regard to the amount of nitrogen in milk, results are recorded where the nitrogen falls appreciably below 0·5 per cent., the lowest percentage obtained in a genuine milk being 0·455.

A method is given for detecting blood in milk, consisting in heating the sample to 50° and centrifugalising, when the blood readily separates. The usual tests may then be applied. W. P. S.

Influence of Variations in the Amount of Soil on the Yield and Composition of Plants. OTTO LEMMERMANN (*J. Landw.*, 1903, **51**, 279—285).—The results of experiments with mustard grown in large and smaller pots respectively, showed that more growth was obtained with the larger than with the smaller pots. As the sand in which the plants were grown could not furnish any nutritive matter, the increased yield in the larger pots must be due to the greater space available for root-development. N. H. J. M.

Influence of the Amount of Water in the Soil on Crops and on the Development of Various Varieties of Cereals. CONRAD VON SEELHORST and W. FRECKMANN (*J. Landw.*, 1903, **51**, 253—269. Compare Abstr., 1902, ii, 42, 524).—The different cereals and the different varieties of the same cereal are affected in different degrees by variations in the percentage of moisture in the soil.

Oats and one variety of barley produced relatively more grain when the amount of water in the soil was increased. In the case of summer wheat and with two varieties of barley, the relatively greatest amount of grain was obtained when the soil contained 55 per cent. of the absolute moisture; with increased moisture, the relation of grain diminished.

The percentage of nitrogen in the crop depends a good deal on the yield and so indirectly on the amount of water in the soil. In the case of barley, however, there was a difference in the percentage of nitrogen independent of the yield, one variety having a higher percentage of nitrogen than the other two notwithstanding that the yield was greater. N. H. J. M.

Effect of Lime and Marl on the Yield of Potatoes and on the Amount of Nitrogen and Mineral Substances. RICHARD ULBRICHT (*Landw. Versuchs-Stat.*, 1903, **59**, 1—25. Compare Abstr., 1902, ii, 581).—Lime and marl increased the yield of tubers and of dry matter in the tubers; the yield of leaf was increased more than the tubers. The amounts of nitrogen in the leaves and tubers were respectively increased and diminished by lime and marl. The lowest amounts of phosphoric acid in leaves were obtained when lime was absent from the soil; in the dry matter of the tubers, the differences in the amounts of phosphoric acid were hardly appreciable. The amount of potassium in the leaves was increased by lime and marl, whilst in the tubers it was generally diminished.

Application of lime alone resulted in leaves containing more calcium and less magnesium than when both lime and marl were applied. The amount of calcium in the leaves diminished when increasing amounts of magnesite were applied. Within certain limits, magnesium may take the place of calcium. In the case of the tubers, no increase in the amount of magnesium and decrease of calcium took place.

N. H. J. M.

Influence of Manuring on the Quality of the Beet. Karl Andrlík (*Zeit. Ver. deut. Zuckerind.*, 1903, **572**, 895—905).—The results of the author's experiments, given in detail in this paper, are briefly as follows: moderate amounts of phosphoric acid (in the form of superphosphate, Thomas meal, &c.) have only a slight influence on the yield, which is, however, increased when larger quantities of the phosphate are applied. Chili saltpetre, whether in large or small amounts, influences the quality and yield of beet favourably. When applied in quantities of 50 to 150 kilos. per hectare, potash in the form of chloride, or, better, sulphate increases the yield of beet and also the amount of sugar. Chili saltpetre and superphosphate together have a more favourable action than either alone. With heavy manuring, which increases the yield considerably, a low quality of beet is obtained. Potassium chloride and superphosphate together, when applied in moderate amount, improve the quality of the roots. Thomas meal and mineral phosphate also increase the amount of sugar. Moderate applications of potassium chloride, Chili saltpetre, and a phosphate give very satisfactory results, and the assimilation of the food materials by the roots is, in this case, more complete than with other manurings.

T. H. P.

Amount of Increase of the Dry Matter, Sugar, and Nitrogenous Constituents of Mangels at Different Periods of Growth. J. Arthur Le Clerc (*Landw. Versuchs-Stat.*, 1903, **59**, 27—81).—Total nitrogen, nitrogen as proteids, amides, and nitrates were determined in mangels at fourteen different dates (June 6th to October 30th), and sugar at nine different periods, commencing July 28th. The same constituents (except sugar) were determined in the leaves and heads at three different dates (August 18th to October 30th). In one sample (November 11th), the determinations were made in three sections, representing the upper, middle, and lower portions of the roots.

The percentage of water in the roots varied with the rainfall, and highest percentage of sugar was found during the period in which the light was strongest. This was followed by a fall in the percentage of sugar, attributed to the young leaves utilising more sugar than they could produce.

Of the three sections of the roots, the upper third contains the most water and nitrogen and the least sugar, the lower third the most dry matter and sugar. The heads contained considerable amounts of sugar.

As regards the relation of sugar to nitrogen, the increase in the former is much more rapid than in the latter. During the earlier periods, nearly half the nitrogen of the roots, and about one-third of the leaves, is present in insoluble forms.

The proteid nitrogen (precipitated successively by copper hydroxide and lead acetate) amounted to 27 to 39 per cent. of the total nitrogen. The amounts of nitrates depended on the rainfall. The amide nitrogen in the roots amounted to 4 per cent. of the total at the commencement, and rose in the fourth period to 12 per cent., and then remained constant. The leaves contained much less amides (2—4 per cent. of the total nitrogen).

Aspartic and glutamic acids could not be detected, and it is thought probable that the amino-acids are chiefly leucine and tyrosine.

N. H. J. M.

Ammonium Sulphate and Organic Nitrogen compared with Sodium Nitrate. PAUL WAGNER, R. DORSCH, F. ASCHOFF, H. RUTHS, and G. HAMANN (*Bied. Centr.*, 1903, **32**, 728—737; from *Arb. Deut. Landw. Ges.*, 1903, Heft. 80. Compare Abstr., 1902, ii, 43).—Addition of farmyard manure, both alone and in conjunction with sodium nitrate, to garden soil resulted in a loss, followed by an increase, in the total amount of nitrates. In the soil alone, and in soil to which sodium nitrate alone was added, the amounts of nitrates remained constant the whole time (64 days). In another experiment, application of farmyard manure to soil diminished the amount of nitrate present, whilst when ammonium salts were added (in addition to farmyard manure) the reduction in the amount of nitrates was limited to the first 12 days (instead of 96 days), and was followed by a considerable increase until 96 days had passed, after which the amount of nitrates again diminished.

The results of field experiments showed that the average yield of oats, barley, wheat, rye, potatoes, sugar-beet, and mangels was 70 when manured with ammonium salts, as compared with sodium nitrate = 100. Of the total nitrogen, 43 per cent. was utilised by the crop when ammonium sulphate was employed, and 62 per cent. with sodium nitrate. Ammonium salts gave better results than sodium nitrate in the case of barley and oats. N. H. J. M.

Manurial Experiments with Precipitated Calcium Phosphate. HENRIK G. SÖDERBAUM (*Bied. Centr.*, 1903, **32**, 737—745; from *Med. kongl. Landsbr.-Akad. Exper.*, 1902, Nos. 75 and 78. Compare Abstr., 1902, ii, 350).—By altering the process by which the phosphoric acid of apatite is rendered more readily available, it is possible to obtain dicalcium phosphate (containing 37·23 per cent. of phosphoric acid soluble in 2 per cent. citric acid) instead of tricalcium phosphate.

The results of experiments with oats and peas showed that the dicalcium phosphate is equal in manurial effect to superphosphate, and that the simultaneous application of calcium carbonate has very little effect unless the amount of phosphate is small.

In conjunction with tricalcium phosphate, and especially with bone meal, calcium carbonate produced a very great reduction in the yield of oats. With superphosphate, calcium carbonate only diminished the yield with small application of phosphoric acid, and was beneficial in presence of large amounts of phosphate. N. H. J. M.

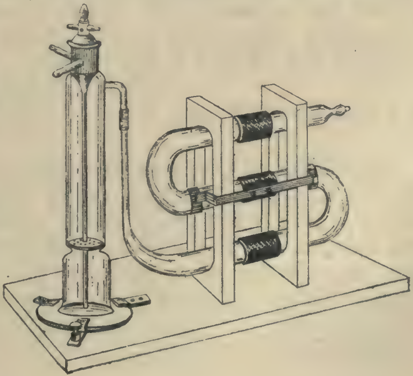
Manurial Value of Bone Meal Phosphoric Acid. Henrik G. Söderbaum (*Bied. Centr.*, 1903, 32, 745—747; from *Kongl. landsbr.-akad. handl. tidskr. Stockholm*, 1903, 42—53).—The yield of oats, manured with bone meal and calcium carbonate, was 7·36 compared with the yield obtained with superphosphate = 100. Bone meal alone gave a yield of 73·5 per cent. of that obtained with superphosphate.

Bone meal in conjunction with sodium nitrate and ammonium sulphate gave better results (with oats) than when the same amount of nitrogen was applied in the form of sodium nitrate. N. H. J. M.

Heating of Bungkil. H. A. C. Van der Jagt (*Chem. Centr.*, 1903, ii, 1141; from *Mededeelingen van het proefstation voor suikerriet in West Java "Kagok" te Pekalongan*, No. 66).—The residue left in the hydraulic presses after removing the oil from ground nuts is used as a manure under the name of bungkil. This material, when stored in large quantity, is liable to deteriorate in quality owing to a process of oxidation. The oxidation of certain components to carbon dioxide is effected by means of bacteria and causes the mass to become hot, and even at times to take fire. The temperature reaches a maximum after a certain time and then slowly sinks. Bungkil contains both ærobic and anærobic bacteria; organisms are also present which become more active at higher temperatures (about 67°), but these play only a secondary part in the process. The changes which occur consist chiefly of the decomposition of proteids, fat, pentosans, and carbohydrates; cellulose is not attacked. E. W. W.

Analytical Chemistry.

A New Drying Apparatus. Friedrich Bolm (*Chem. Zeit.*, 1903, 27, 1037).—The apparatus, which is intended for the purification of air or oxygen used in organic combustions, will be readily understood from the figure. Either gas may be admitted by a single movement of the tap.



The perforated leaden disc is covered with a layer of glass beads, a little cotton wool is introduced, and on this is placed a layer of soda-lime, which is then covered with a thin layer of calcium chloride.

Strong sulphuric acid is then introduced by means of the tube into the lower part of the cylinder, and when it needs renewing it is siphoned off again. The serpentine tube, composed of three pieces (*Zeit. anal. Chem.*, 1899, **38**, 289), may be readily filled and cleaned. L. DE K.

An Apparatus for Extracting Liquids with Ether. FRIEDRICH KUTSCHER and HERMANN STEUDEL (*Zeit. physiol. chem.*, 1903, **39**, 473—476).—The solution to be extracted is placed in a vessel shaped like a test-tube, but constricted at the top to form a long neck. A wide side-tube leads from the bottom of this neck to a flask in which the ether is boiled, the flask and tube being connected by a ground-in joint. The neck of the vessel containing the solution is fitted to a reflux apparatus. The condensed ether falls drop by drop into a tube contained in the extraction vessel and reaching to the bottom of the same. From the lower end of this tube, the ether escapes into the solution, and in rising through the latter is caused, by means of a spiral wound round the outside of the tube, to take a long path through the solution. By the lengthened contact of the ether with the solution, the extraction is hastened. As the ether collects on the surface, it flows through the side-tube into the heating flask. W. P. S.

Apparatus for the Electrolytic Determination of Metals, using a Rotating Cathode. E. S. SHEPHERD (*J. Physical Chem.*, 1903, **7**, 568—570).—Details are given of the apparatus used in the author's laboratory. It does not differ in principle from that described by Gooch and Medway (Abstr., 1903, ii, 613). The author confirms their result that an electrolytic deposition can be carried out much more rapidly when a rotating cathode is employed. J. C. P.

A very Sensitive Indicator from *m*-Toluidine. JULIUS TRÖGER and W. HILLE (*J. pr. Chem.*, 1903, [ii], **68**, 297—309).—See this vol., i, 118.

Potassium Tetroxalate in Volumetric Analysis. OTTO KÜHLING (*Zeit. angew. Chem.*, 1903, **16**, 1030—1032).—The author has proved by a number of experiments that recrystallised potassium tetroxalate, obtained by rapidly cooling and stirring the hot saturated solution, and allowed to dry in the air, has the formula

$$C_2O_4HK,C_2O_4H_2,2H_2O,$$

and may be safely used for standardising purposes. L. DE K.

Oxidation of Organic Substances with Persulphates in Acid Solution. MAX DITTRICH (*Ber.*, 1903, **36**, 3385—3387. Compare Abstr., 1903, ii, 581).—Aliphatic substances, especially those containing halogen, are decomposed when boiled with acid persulphates; this can be made use of to estimate the halogen in organic substances provided silver nitrate is initially added, and oxidation products of the halogens, such as chlorates and perchlorates formed during the reaction, are subsequently reduced. E. F. A.

Action of Boric Acid on Iodides; its Use for the Separation of Iodine from Iodides in the presence of Bromides and Chlorides. Henri Baubigny and Paul Rivals (*Compt. rend.*, 1903, **137**, 650—653).—Whilst pure boric acid only decomposes saturated solutions of bromides and chlorides on heating, it liberates hydrogen iodide from solutions of iodides in the cold, and in the presence of a suitable oxidising agent can be employed for the estimation of iodine in the presence of chlorides and bromides. For this purpose, the dilute saline solution is distilled at a temperature of 45—50° with boric acid and manganese dioxide (prepared by reducing a permanganate by means of alcohol), and the iodide collected in a receiver containing an alkaline solution. Theoretical results are obtained when the boric acid is present in the proportion of 10 grams for every 100 c.c. of the solution, and ten times the quantity of manganese dioxide required by theory is employed. Control experiments with bromides and chlorides gave traces of bromine in the distillate only when the proportions of bromide and boric acid were large; the chlorides were even more difficultly decomposed. M. A. W.

Conditions under which Iodine can be Separated in the form of Cuprous Iodide from a Mixture of Alkali Chlorides, Bromides and Iodides. Henri Baubigny and Paul Rivals (*Compt. rend.*, 1903, **137**, 753—756. Compare preceding abstract).—The iodine in a mixture of alkali chlorides, bromides, and iodides can be completely separated as cuprous iodide if excess of copper sulphate is added to the solution, together with an alkaline arsenite and a trace of a ferrous salt. The copper arsenite formed reacts with the liberated iodine to form cuprous iodide according to the equation: $2CuHAsO_3 + I_2 + 2H_2O + 2CuSO_4 = 2CuHAsO_4 + Cu_2I_2 + 2H_2SO_4$, whilst the ferrous salt reduces any small quantity of copper iodide that may remain in solution. The reaction proceeds in the cold, the bromides and chlorides undergoing no reduction even after 12 hours. M. A. W.

Separation of Iodides from Chlorides and Bromides in a Mixture of Alkali Halogen Salts by Conversion into Iodic Acid, and Preparation of Pure Iodine. Henri Baubigny and Paul Rivals (*Compt. rend.*, 1903, **137**, 927—929).—The solution of mixed halogen salts is rendered alkaline by means of sodium carbonate and the iodide oxidised to the iodate by potassium permanganate. The bromide and chloride are then separately removed from the solution by distillation with copper sulphate and potassium permanganate (Abstr., 1898, ii, 90, 137). The iodine which remains in the mother liquor as iodic acid is estimated as silver iodide by the addition of silver nitrate and subsequent reduction by sulphur dioxide.

Pure iodine (free from chlorine, bromine, and cyanogen iodide) can be prepared by Gay Lussac's method from the solution of the iodate after the elimination of the bromides and chlorides; for this purpose, five-sixths of the solution are treated with an alkali sulphite to reduce the iodate to the iodide and then mixed with the remaining sixth part, when the following reaction occurs: $HIO_3 + 5HI = 3H_2O + 3I_2$.

M. A. W.

The Iodine-Tannin Reaction for Hydroxyl Ions. WILHELM VAUBEL (*Zeit. angew. Chem.*, 1903, 16, 1073—1074).—If to a solution of tannin is added a salt and then a particle of solid iodine, a red coloration is noticed with sodium carbonate, sodium hydrogen carbonate, sodium metaborate, disodium hydrogen phosphate, diammonium hydrogen phosphate, potassium cyanide, ammonium carbonate, potassium metantimoniate, sodium acetate, and barium carbonate, also with sodium chloride, sodium nitrate, potassium chloride, potassium bromide, potassium bromate, potassium chlorate, potassium nitrate, ammonium nitrate, ammonium chloride, ammonium carbonate, calcium chloride, barium chloride, barium nitrate, potassium sulphate, and ammonium sulphate, also with all alkaline hydroxyl compounds.

No red colour is obtained with potassium iodide, potassium thiocyanate, or sodium thiosulphate and sodium hydrogen sulphite, or copper sulphate, iron sulphate (blue-black), ferrous chloride (ditto), copper nitrate, mercuric chloride, lead acetate and zinc sulphate, which show a more or less acid reaction, or normal potassium chromate, potassium dichromate, and potassium ferrocyanide.

The reaction is only obtained when hydroxyl ions are present and the intensity increases with the number of hydroxyl ions. Its occurrence with so many so-called neutral salts shows that they have undergone some hydrolytic dissociation, even if only to a slight extent.

L. DE K.

Estimation of Sulphur in Pyrites. GEORG LUNGE (*Ber.*, 1903, 36, 3387—3389).—A reply to Silberberger (Abstr., 1903, ii, 751).

J. J. S.

Exact Estimation of Sulphur in Vegetable and other Organic Substances. W. E. BARLOW (*J. Landw.*, 1903, 51, 289—313).—A modification of Berthelot's method. The substance is heated in a combustion tube first in a current of carbon dioxide and then in oxygen, the gases being passed over heated soda-quartz (prepared by mixing sand with 3—4 grams of sodium carbonate dissolved in water and drying) in the front part of the tube, the end of which, drawn out and turned down, dips into a beaker of water. When the combustion is finished (20—30 minutes), the boat containing the ash is taken out. The soda-quartz, asbestos, &c., are emptied into a dish, into which the tube is then rinsed with water and dilute hydrogen chloride. It is then evaporated to dryness, heated at 110°, stirred with hydrochloric acid, and extracted with water. The sulphate is then precipitated with barium chloride.

The method is easily carried out and gives correct results. All methods in which the substance is first burnt (without or with calcium acetate) are unsatisfactory.

The combustion tube, which is provided with a side-tube to admit oxygen in front of the substance, is figured in the original.

N. H. J. M.

Titration of Sulphuric Acid by Benzidine. Wolf Johannes Müller (*Zeit. angew. Chem.*, 1903, **16**, 1017).—A controversy with Raschig on the subject of the estimation of sulphates by means of benzidine hydrochloride (Abstr., 1903, ii, 691). L. de K.

Estimation of Selenium. Giovanni Pellini and E. Spelta (*Gazzetta*, 1903, **33**, ii, 89—92).—The best method for the estimation of selenium is based on the reduction of selenous acid by means of hydrazine: $N_2H_4 + SeO_2 = Se + 2H_2O + N_2$, as was pointed out by Jannasch (Abstr., 1899, ii, 59). According to the method given by the authors, the nitrogen evolved in this reaction is measured in a modified form of Schultze and Tiemann's apparatus, the gas being collected over boiled water. The selenium dioxide, dissolved in water or very dilute hydrochloric acid, is introduced into the flask of the apparatus, and its volume brought up to 50 c.c.; a few grams of sodium chloride are then added, and the liquid boiled until all the air is driven off. A solution of about 2 grams of hydrazine hydrochloride or sulphate, acidified with hydrochloric acid and previously boiled, is next added. The evolution of nitrogen is soon complete, and stops abruptly, so that the end of the reaction is easily seen. The volume of nitrogen is then measured and reduced to 0° and 760 mm. Small quantities of selenium dioxide can be estimated in this way, since 1 gram of the dioxide yields 201·83 c.c. of nitrogen. Test experiments gave good results.

Tellurium cannot be estimated in this way, as the evolution of nitrogen is very slow and continues for a long time. Neither can selenium be separated from tellurium by means of hydroxylamine, which does not act on selenium dioxide in the way stated by Jannasch (*loc. cit.*), namely, $4NH_2{\cdot}OH + SeO_2 = Se + 6H_2O + 2N_2$. T. H. P.

Estimation of Nitrogen by Kjeldahl's Method. S. P. L. Sörensen and C. Pedersen (*Zeit. physiol. Chem.*, 1903, **39**, 513—525).—This method was found to give good results in the case of creatine, creatinine, lysine compounds, and uric acid. Kutscher and Steudel's statements (Abstr., 1903, ii, 687) that the method is untrustworthy are further combated. W. P. S.

Estimation of Ammonia in Urine. C. Demon (*J. Pharm. Chim.*, 1903, **18**, [vi], 289—293).—The amount of ammonia in urine 24 hours after emission was found to be larger than the quantity present at the time of emission. The increase in some instances amounted to 100 per cent. of the ammonia originally in the urine. The addition of 5 per cent. of sodium fluoride prevented any change taking place, urine thus preserved giving exactly the same results after 24 hours as when fresh. Folin's method (Abstr., 1901, ii, 575) was employed for estimating the ammonia. W. P. S.

Estimation of Ammonia in Urine. Otto Folin (*Zeit. physiol. Chem.*, 1903, **39**, 477—478).—It is pointed out that the method described by Krüger and Reich (Abstr., 1903, ii, 688) had been previously published by Schaffers (Abstr., 1903, ii, 180), to whom is due the idea of adding alcohol to prevent frothing during the distillation. Hausmann's method was found to be untrustworthy for the estimation of ammonia in digestion fluids. W. P. S.

New Reaction of Hydroxylamine. Louis J. Simon (*Compt. rend.*, 1903, **137**, 986—987).—The addition of a very dilute alkaline solution of sodium nitroprusside to a solution of hydroxylamine or one of its salts produces on boiling a yellow coloration, deepening through orange to a deep cherry-red and becoming pink on dilution. Nitrogen and nitrous oxide are evolved during the boiling. The tint obtained in a 0·1 per cent. solution of hydroxylamine hydrochloride is sufficiently intense to remain visible after further diluting 1000 times. The coloration in very dilute solutions is, however, largely dependent on the quantity of reagent employed. The reaction is not given by oximes. C. H. D.

Estimation of Nitrates in presence of Nitrogenous Organic Matter. Theodor Pfeiffer (*Zeit. anal. Chem.*, 1903, **42**, 613—617).—The author reaffirms, and brings fresh experiments to prove, the correctness of his statement, that, in presence of ammonium sulphate or urea, Schlœsing's method always gives low results, and points out that even the numbers obtained by Liechti and Ritter (Abstr., 1903, ii, 574) confirm this. M. J. S.

Reduction of Nitric Acid in Metallic Nitrates to Ammonia by the Electric Current. Wm. H. Easton (*J. Amer. Chem. Soc.*, 1903, **25**, 1042—1044).—Vortmann (*Zeit. anal. Chem.*, 1880, **19**, 11) has stated that nitrates may be completely reduced to ammonia by electrolysis in the presence of copper sulphate. As many have failed to get satisfactory results, the author has reinvestigated the process and finds it to be perfectly satisfactory provided the following conditions are adhered to.

Amount of nitrate, about 0·5 gram; copper sulphate, about 0·5 gram; cathode, platinum or copper plate of 100 sq. cm. area; amperes, 0·15 to 3·0; time, $1\frac{1}{4}$ hours for 3, and $8\frac{1}{2}$ hours for 0·15 ampere; volts, from 3 to 8; dilution, 150 c.c.; sulphuric acid of sp. gr. 1·062, 30 c.c. L. de K.

Reaction for Nitrites. W. A. Blunt (*Analyst*, 1903, **28**, 313).—The addition of potassium ferrocyanide solution to a water containing nitrites causes a urine-yellow tint to appear, due to the conversion of the ferrocyanide into ferricyanide. It is suggested that it might be feasible to use the reaction as a quantitative colorimetric method for estimating nitrites. W. P. S.

Solubility of Magnesium-Ammonium Phosphate in Ammonium Citrate. A. Bolis (*Chem. Zeit.*, 1903, **27**, 1151).—A series of experiments showing that two grams of hexahydrated magnesium ammonium phosphate in contact with 100 c.c. of ammonium citrate solution (containing 400 grams of citric acid per litre) lose on an average 0·457 per cent. of their weight owing to solubility. This will average 0·587 per cent. when working at 50°. L. de K.

Colorimetric Estimation of [small amounts of] Phosphoric Acid in the presence of Silica. OSWALD SCHREINER (*J. Amer. Chem. Soc.*, 1903, 25, 1056—1062).—The yellow coloration caused by the action of molybdate solution on phosphoric acid may, as is well known, be used for its colorimetric estimation, but the reaction is interfered with by the presence of silica, which also gives a yellow colour. The author, however, has found that whereas the phosphate colour is always the same, that of the silica differs very considerably according to the method of working. On this principle, the following process has been founded. Fifty c.c. of the solution are mixed with 5 c.c. of nitric acid and 4 c.c. of ammonium molybdate solution, and after 20 minutes the colorimetric reading is made. This gives a in the equation (1). Another 50 c.c. are then mixed with 4 c.c. of the ammonium molybdate; after one hour, 5 c.c. of nitric acid are added, and after 20 minutes the reading is made. This then gives b in equation (2).

The equations are (1) $x+y=a$; (2) $\frac{1}{2}x+y=b$, in which x is the silica, and y the phosphate reading, whilst a is the experimental reading under the one, and b that under the other condition.

Preparation of the Standard Colorimetric Solution.—Ten c.c. of a solution of disodium hydrogen phosphate containing 0·0001 gram of phosphoric anhydride per c.c. are diluted to 80 c.c., 9 c.c. of nitric acid of sp. gr. 1·07 are added, and then 8 c.c. of an aqueous solution of ammonium molybdate containing 50 grams of the salt per litre. After diluting to 100 c.c. and waiting for 20 minutes, it is ready for use Each c.c. of this solution represents 0·00001 gram of phosphoric oxide.

The amount of phosphoric acid may now be readily calculated from the readings. L. DE K.

Detection and Estimation of Traces of Arsenic in Organs, &c. GABRIEL BERTRAND (*Ann. Chim. anal.*, 1903, 8, 361—369, 415—421).—The substance is repeatedly evaporated with a mixture of 9 parts of nitric acid and 1 part of sulphuric acid, the charred mass is extracted with water and the filtrate mixed with a little sulphurous acid and evaporated to a small bulk. It is then treated for some hours with hydrogen sulphide, the precipitate is washed and dissolved in ammonia, and, after evaporating, the residual arsenious sulphide is freed from any traces of organic matter by a renewed treatment with nitric and sulphuric acids. The arsenical solution thus obtained is then ready for being introduced into the Marsh apparatus.

The nitric acid used in these operations is freed from arsenic by repeated distillation with addition of one-tenth of its volume of sulphuric acid. A modified form of the Marsh apparatus is used. This consists of a 90 c.c. generating flask fitted with a specially constructed stoppered funnel tube, to which is sealed a side-tube admitting carbon dioxide or hydrogen. Platinised zinc is introduced and the air inside the apparatus is swept out, 10 c.c. of dilute sulphuric acid (1 : 5) are introduced, and the reduction tube is heated. The spray of liquid is practically retained in a bulb before the gas passes through a drying tube filled with desiccated cotton wool, which the author considers to be more effective than calcium chloride. The arsenical liquid is now introduced and rinsed down with successive small portions of dilute sulphuric acid (1:5); during the operation the current of hydrogen should not exceed 4 or 5 c.c. per minute, which may be gauged by dipping the bent end of the decomposition tube into water. The gases then pass through the reduction tube, which is heated over a length of 10 cm. and is enveloped in a sheet of metal. At a very short distance from the burners, the tube is cooled by the simple device of wrapping a piece of filter paper round it and keeping this moist by allowing water to drip on it from a reservoir. It is on this cold spot that the arsenical mirror will become visible, generally after about 5 minutes, although it may take 1 or even 2 or 3 hours. From the appearance of the mirror, the quantity of arsenic may be judged as usual.

L. DE K.

Determination of the Heat of Combustion by means of Combined Oxygen and Parr's Method. HERMANN LANGBEIN (*Zeit. angew. Chem.*, 1903, **16**, 1075—1077).—An adverse criticism of Parr's coal calorimeter (Abstr., 1900, ii, 710), in which the combustion is effected with sodium peroxide. L. DE K.

Estimation of Carbon Dioxide in Electrolytic Chlorine. C. OFFERHAUS (*Zeit. angew. Chem.*, 1903, **16**, 1033—1034).—1*st Method.*—A definite volume of the gas is treated with the usual precautions in *N*/2 sodium hydroxide contained in a Bunte-burette, when the loss in volume represents the joint chlorine and carbon dioxide. Another portion of the gas is then treated with potassium iodide and the liberated iodine estimated by titration and calculated into its equivalent volume of chlorine.

2*nd Method.*—A definite volume of the gas is absorbed in 45 c.c. of *N*/2 sodium hydroxide, the amount of carbon dioxide in which is accurately known. After introducing into the burette 5—10 c.c. of 3 per cent. hydrogen peroxide and shaking, the liquid is diluted to 200 c.c., and in 50 c.c. the carbon dioxide is titrated by Winkler's process.

3*rd Method.*—Instead of titrating the carbonic acid, it may be advantageously determined by the gas-volumetric apparatus devised by Lunge and Marchlewski. L. DE K.

Estimation of Carbon Dioxide in presence of Sulphites, Sulphides, and Organic Substances. U. STANEK and JAK. MILBAUER (*Zeit. Ver. deut. Zuckerind.*, 1903, **572**, 958—961).—The author's method consists in passing the gas, evolved by the action of hydrochloric acid on a mixture of carbonate with sulphite or sulphide, over moist, granulated iodine, which frees it from sulphur dioxide or hydrogen sulphide; the iodine vapours carried away by the gas are then removed by means of aluminium turnings and the remaining carbon dioxide dried and absorbed in potash bulbs. A special apparatus has been devised for the estimation. The method is shown to give good results. T. H. P.

Estimation of Very Small Amounts of Potassium. FRANK K. CAMERON and G. H. FAILYER (*J. Amer. Chem. Soc.*, 1903, **25**, 1063—1073).—Briefly, the method is as follows: the potassium is separated in the usual way with platinum chloride, the excess of which is removed by washing with successive small quantities of alcohol. When the alcohol has evaporated, the precipitate is dissolved in hot water, and when cold a drop of hydrochloric acid is added. On now adding potassium iodide, a pink colour is developed which reaches its final intensity in four hours. The liquid is then compared in a suitable colorimeter with a solution containing a known amount of potassium platinichloride.

If it is desired to work with yellow solutions instead of pink ones, no hydrochloric acid should be added and the mixture should be heated with a little alcohol. L. DE K.

Titrimetric Estimation of Potassium as Potassium Bismuth Thiosulphate. FRIEDRICH W. KÜSTER and MAX GRÜTERS (*Zeit. anorg. Chem.*, 1903, **36**, 325—331).—Potassium bismuth thiosulphate, $K_3Bi(S_2O_3)_3$, is so sparingly soluble in dilute alcohol in comparison with the corresponding sodium salt that a method based on this difference between the two salts was devised by Carnot (Abstr., 1878, 448) for the quantitative separation of sodium from potassium. The authors find, however, that this method is quite unsuitable, since the precipitated potassium bismuth thiosulphate always contains the isomorphous sodium salt as an impurity. A. McK.

Electrolytic Separation of Silver from Antimony. ARTHUR FISCHER (*Ber.*, 1903, **36**, 3345—3350).—Solutions containing silver and antimony salts were electrolysed in presence of tartaric and nitric acids, first using 1·35 volt and, after three hours, 1·4—1·45 volts. The silver is first deposited, and is quite free from antimony, the deposition of which does not begin until 1·5—1·6 volts are employed. The electrolysis may be conducted at the ordinary temperature with a current of 0·05—0·01 ampere, when the separation of silver is complete after 18 hours, or at 50—60° with a current of 0·12—0·02 ampere, when the separation requires 8—9 hours. When the silver has been all deposited, sodium sulphide is added to the solution, which has been made alkaline by sodium hydroxide, and the electrolysis then conducted with 1·3—1·6 volts and 1—1·5 amperes at 60—70°

The separation may also be conducted with a solution to which tartaric acid and potassium cyanide have been added. A. McK.

Indirect Estimation of Calcium and Magnesium. The Magnesites of Greece. ANASTASIOS K. CHRISTOMANOS (*Zeit. anal. Chem.*, 1903, **42**, 606—612).—On account of the difficulty of effecting an accurate separation of calcium and magnesium by a single precipitation of the calcium as oxalate, the author advocates the indirect method of weighing both metals as carbonates, and then either estimating the carbon dioxide or converting the mixture of carbonates into sulphates. M. J. S.

Qualitative Separation of Barium, Strontium and Calcium by means of Potassium Dichromate and Ammonia. C. REICHARD (*Chem. Zeit.*, 1903, **27**, 1035—1036).—The neutral solution of the three alkaline earths is mixed with a cold saturated solution of potassium dichromate, which precipitates the barium only. Ammonia is carefully added to the filtrate until this turns yellow, when a characteristic precipitate of strontium chromate will gradually form (Abstr., 1903, ii, 757). The calcium is then precipitated with ammonium oxalate.

L. DE K.

Volumetric Estimation of Magnesium. ERWIN RUPP (*Arch. Pharm.*, 1903, **241**, 608—613).—An arsenate is best estimated volumetrically by mixing it with dilute sulphuric acid and 3—5 grams of potassium iodide in a long-necked flask, adding a few pieces of glass or platinum, and boiling with the flask in an inclined position until the colour of the iodine has nearly disappeared. The solution is then diluted with a little water, the iodine remaining is removed by adding sulphurous acid, the excess of the latter is removed by boiling, and the solution is cooled, mixed with a slight excess of sodium hydrogen carbonate, and titrated with $N/10$ iodine solution.

For the estimation of magnesium, the solution of the salt is added to a solution containing ammonium chloride, ammonia, and a measured quantity (in excess) of an arsenate solution of known strength, both solutions being boiling. The solution is diluted to 100 c.c., shaken frequently for a time, and allowed to remain twelve hours in all, after which it is filtered from the precipitate of magnesium ammonium arsenate and the excess of arsenate determined in 50 c.c. of the filtrate as described above. One c.c. of an $N/10$ solution corresponds with 0·001218 gram of magnesium. In six experiments, the error varied between $-0·7$ and $+0·9$ per cent. of the quantity estimated.

Barium can be estimated in a similar manner. C. F. B.

Detection of Zinc in Cases of Poisoning. DIOSCORIDE VITALI (*L'Orosi*, 1902, **25**, 145—148).—The author points out that when testing for zinc in animal organs and making use of potassium chlorate for the destruction of the organic matter, it is important to ascertain that the chlorate employed is free from zinc, as one of the methods for manufacturing it consists in treating zinc oxide with chlorine and heating the product of the reaction with potassium chloride.

T. H. P.

Use of Litharge in Dry Lead Assaying. A. COPPALLE (*Ann. Chim. anal.*, 1903, **8**, 412—415).—When dealing with very poor lead ores, it is customary to add a known weight of litharge so as to get a larger button. The quantity of lead contained in the litharge, which has been ascertained by a separate experiment, is then deducted from the weight of the button. The author states that it is very important when assaying this litharge to flux it with addition of the same kind of gangue as is contained in the ore to be analysed, particularly when dealing with samples of galena. L. DE K.

Separation of Cerium by means of Potassium Permanganate. C. Richard Boehm (*Zeit. angew. Chem.*, 1903, **16**, 1129—1132).—For technical purposes cerium may be separated from the accompanying elements by boiling with potassium permanganate in the presence of sodium hydroxide. An excess of the latter should, if possible, be avoided, so as to precipitate the cerium only, the amount of permanganate being regulated by a preliminary experiment. The precipitate is washed by decantation with water, and then treated with water containing 10—20 per cent. of nitric acid to dissolve any of the other earths that may have been precipitated. The residue then contains, besides manganese dioxide, the bulk of the cerium as dioxide, which may be extracted by heating with stronger acids. L. de K.

Behaviour of Cerium, Lanthanum, Neodymium, Praseodymium, Thorium, and Zirconium towards Organic Bases. Burt L. Hartwell (*J. Amer. Chem. Soc.*, 1903, **25**, 1128—1136. Compare Jefferson, Abstr., 1902, ii, 534).—With the view of separating thorium and zirconium from cerium, lanthanum, neodymium, and praseodymium, the behaviour of a large number of organic bases towards salts of cerium, &c., was studied. For the separation of thorium from zirconium, the chloroanilines and hexamethylenetetramine appeared the most suitable of the bases tried, whilst *p*-toluidine gave promising results in the separation of zirconium and thorium from lanthanum, neodymium, and praseodymium.

A. McK.

Method of Estimating the Amounts of the Oxides of Didymium and Erbium by means of the Absorption Bands of their Solutions, and its Application to other Solutions. John E. Purvis (*Proc. Camb. Phil. Soc.*, 1903, **12**, 202—205).—A spectroscope is so arranged that the absorption spectra of two solutions, one of known, the other of unknown strength, can be carefully compared. The vertical vessel containing the solution of known strength is provided with a hollow cylinder closed with a glass plate; this cylinder is moved up or down until the intensities of the absorption bands of the two parallel spectra are identical. The concentrations of the solutions are then inversely as the thicknesses producing the absorptions, and hence, as is shown in the paper, it is possible to estimate very satisfactorily the amount of didymium and erbium in the solution of unknown strength. J. C. P.

Electrolytic Estimation of Manganese and its Separation from Iron and Zinc. George P. Scholl (*J. Amer. Chem. Soc.*, 1903, **25**, 1045—1056).—Manganese and iron may be estimated simultaneously by electrolysing the sulphate solution in the presence of ammonium acetate and formic acid. Zinc and manganese may be similarly separated in the presence of formic acid and ammonium formate. The iron or zinc are deposited as metals at the cathode, whilst the manganese is precipitated as peroxide on the anode. For working details, the original paper should be consulted. L. de K.

Occurrence of Iron and Manganese in Service Water. Ed. von Raumer (*Zeit. anal. Chem.*, 1903, **42**, 590—602).—It appears to be probable that the difficulties which have been occasioned in various continental water services by the growth of *Crenothrix polyspora* in the water pipes, with the resulting formation of ferruginous deposits, which produce obstructions, are only encountered when the iron in the water is in combination with organic (humous) acids. *Crenothrix*, being absolutely free from chlorophyl, is incapable of assimilating purely inorganic materials, and it has been found that processes of purification from iron, which deal only with the inorganic compounds of that metal, have not prevented the growth of the alga. In the estimation of iron in a water supply, it is therefore necessary to destroy the organic matter, and this has not been done in some of the older processes (for example, Jolles' colorimetric method). All filtrations of the iron solution must also be avoided, as it is practically impossible to wash out the iron completely from a cellulose filter, and the use of an asbestos filter is precluded by the fact that the iron silicates, which are often present, are slowly attacked by hot acids. The author evaporates 10—20 litres of the water to dryness with addition of a little sulphuric acid and potassium hydrogen sulphate, fuses the residue, dissolves it in dilute sulphuric acid, boils to expel any sulphurous acid which may have been formed, reduces with zinc, and titrates with permanganate. The presence of a white turbidity in the solution (silica, calcium sulphate, &c.) rather assists the observation of the end-point.

Besides the occurrence of obstructions in water pipes occasioned by ferruginous deposits, several cases have been observed in which deposits rich in manganoso-manganic oxide have been formed. Water from deep wells appears very frequently to be manganiferous; that from natural springs is generally free. M. J. S.

Rivot's Quantitative Estimation of Iron in presence of Zirconium. Alexander Gutbier and C. Trenker (*Zeit. anorg. Chem.*, 1903, **36**, 302—312. Compare Abstr., 1902, ii, 701).—Polemical. A reply to Daniel and Leberle (Abstr., 1903, ii, 392). A. McK.

Analysis of Ferrosilicon. Hj. Lidholm (*Zeit. angew. Chem.*, 1903, **16**, 1030—1031).—About 0·3 gram of the finely powdered sample is fused in a nickel crucible with 15 times its weight of a mixture of 1 part of sodium potassium carbonate and 2 parts of sodium peroxide; this mixture should be perfectly dry. The mass is dissolved in water, acidified with hydrochloric acid in excess, and the silicic acid is separated as usual.

The process also answers for the estimation of sulphur, which may be precipitated with barium chloride after removing the iron with ammonia. In this case, some 10—15 grams of the sample should be operated on. L. de K.

Analysis of Commercial Nickel. Auguste Hollard (*Ann. Chim. anal.*, 1903, **8**, 401—405).—Five grams of the metal are dissolved in a large, narrow beaker, covered with a funnel, in 25 c.c. of nitric acid and 25 c.c. of water, 10 c.c. of sulphuric acid are added, and the nitric acid is expelled by heating. The residue is dissolved in water, ammonia is added in slight excess, and the whole boiled for a moment. Twenty-five c.c. of ammonia are added, and then a few c.c. of hydrogen peroxide, and after diluting to 300 c.c. the nickel is precipitated as metal by electrolysis at 90°, using a current of 1 ampere. When all the nickel has deposited, the precipitate (of iron, &c., see later) is collected, redissolved in sulphuric acid, mixed with excess of ammonia, added to the main liquid, and the whole is once more submitted to electrolysis.

The nickel, which also contains any cobalt or copper, is, after weighing, dissolved in a mixture of 50 c.c. of nitric acid and 50 c.c. of water, and after diluting to 300 c.c. the copper is precipitated by means of a current of 1 ampere. The cobalt is separated from the nickel by the potassium nitrite process and finally deposited as metal by electrolysis.

The precipitate previously mentioned contains silica, alumina, iron, and also arsenic and antimony. After dissolving in dilute sulphuric acid, the arsenic and antimony are precipitated with hydrogen sulphide. After expelling the latter by boiling, 5 grams of citric acid and 25 c.c. of strong sulphurous acid are added, followed by 25 c.c. of ammonia. The liquid is now neutralised with dilute sulphuric acid, again made alkaline with a few c.c. of ammonia, diluted to 300 c.c., and electrolysed at 40°, using a current of 1 ampere. As the metallic iron so obtained is not pure enough for direct weighing, its exact amount is found by titration with permanganate.

The mother liquor from the iron is evaporated with sulphuric acid to destroy the citric acid, and in the resulting filtrate any aluminium, calcium, and magnesium are then estimated as usual.

Silicon and sulphur are estimated by treating 5 grams of the metal with nitric acid and expelling this by repeated evaporation to dryness with hydrochloric acid. The silica thus rendered insoluble is fused with sodium carbonate and potassium nitrate to obtain the remainder of the sulphur as sulphate, which, after being freed from silica by evaporation with hydrochloric acid, is then added to the main solution and precipitated with barium chloride. The silica is finally weighed and its purity ascertained by evaporation with hydrofluoric acid. Carbon is estimated as in steels. For the estimation of arsenic and antimony, compare the previous articles of the author (Abstr., 1900, ii, 438, 442).

L. de K.

Electrolytic Precipitation of Nickel from Phosphate Solutions. Walter T. Taggart (*J. Amer. Chem. Soc.*, 1903, 25, 1039—1041).—The nickel sulphate solution is precipitated with disodium hydrogen phosphate, the precipitate is redissolved in phosphoric acid, and the solution is then electrolysed in a platinum dish, serving as cathode, while a flat platinum spiral is used as anode. Some 40 experiments giving full details as to strength of currents, temperature, dilution, &c., are recorded, showing the accuracy of the method.

Attempts to separate in this manner nickel from manganese, iron, aluminium, and chromium were, however, unsuccessful. L. de K.

Influence of Gases on the Separation of Metals by Electrolysis: Separation of Nickel and Zinc. AUGUSTE HOLLARD and L. BERTIAUX (*Compt. rend.*, 1903, **137**, 853—855).—Hitherto it has been impossible to effect a separation of metals, the electrolytic potentials of which are higher than that of hydrogen; the difficulty is due to the evolution of hydrogen and oxygen at the cathode and anode, and the consequent increase in resistance of the cell. Suppression of hydrogen at the cathode (Abstr., 1903, ii, 291) has led to the separation of zinc and cadmium; zinc and nickel can be separated by preventing the formation of oxygen at the anode. The evolution of oxygen can be avoided either by employing a soluble anode of zinc amalgam or by introducing sulphurous acid into the solution. The former method only permits the estimation of nickel; when both metals are to be determined, the latter process is adopted. The details are as follows: the cell is provided with platinum electrodes, the cathode being in the form of gauze. The solution occupies 300 c.c., and contains the nickel and zinc as sulphates, together with 10 grams of ammonium sulphate, 5 grams of magnesium sulphate, 5 c.c. of a saturated solution of sulphur dioxide, and 25 c.c. of aqueous ammonia of sp. gr. 0·924. Electrolysis is conducted at 90°, with a current of 0·1 ampere for four hours, after which a sample of the liquid should give no colour with ammonium sulphide. After passing the current for another hour, the process is complete and the deposit of nickel is weighed. S. S.

Separation of Chromium from Iron and Aluminium. GEORG VON KNORRE (*Zeit. angew. Chem.*, 1903, **16**, 1097—1107).—Iron and aluminium may be completely removed from a solution containing chromium by adding an excess of pure ammonium persulphate and sufficient sulphuric acid to prevent the precipitation of basic ferric sulphate. On boiling the dilute solution, the chromium is converted into chromic acid, from which the iron and aluminium may be separated by means of ammonia. As the sesquioxides retain a trace of chromium, they should, after washing, be redissolved in dilute sulphuric acid and again boiled with persulphate. In accurate analysis, it is as well to repeat the operation a third time. The chromic acid may now be estimated in various ways, for instance, by acidifying the filtrate with sulphuric acid, diluting, and destroying the excess of persulphate by a 20 minutes' boiling, and finally titrating with ferrous sulphate and permanganate.

Iron may also be conveniently separated by the author's nitroso-β-naphthol process (Abstr., 1887, 530) if to 100 c.c. of the liquid 5 c.c. of hydrochloric acid are added. The precipitate should be collected after remaining in a cold place for between 8 and 16 hours. If it is desired to estimate the chromium in the filtrate, this should be evaporated to dryness; the residue is then dissolved in dilute sulphuric acid, boiled with a little sodium hydrogen sulphite to reduce any chromic acid formed, and finally precipitated with ammonia. L. DE K.

Action of Hydrogen Peroxide on the Sulpho-salts of Tin, Antimony, and Arsenic. A. KOLB (*Zeit. angew. Chem.*, 1903, **16**, 1034—1035).—A practical confirmation of the results obtained by Walker (Trans., 1903, **83**, 184). L. DE K.

Estimation of Titanium. J. WATSON BAIN (*J. Amer. Chem. Soc.*, 1903, **25**, 1073—1091).—A criticism of the various methods for the separation of titanium. The most accurate process is that of Blair, fully described by Pope, for the particulars of which the reader is referred to the *Trans. Amer. Inst. Min. Eng.*, **29**, 372.

Another excellent process is, however, that proposed by Baskerville (*J. Soc. Chem. Ind.*, 1900, **19**, 419), which may be briefly summarised as follows. The ore is fused with potassium pyrosulphate, the fused mass is extracted with water, and the filtrate precipitated with ammonia, avoiding excess. The hydroxides are collected, washed, and redissolved in dilute hydrochloric acid. After neutralising as nearly as possible with ammonia, the liquid is saturated with sulphur dioxide and then boiled for three minutes. If the precipitated titanium dioxide is not perfectly white, the process must be repeated.

L. DE K.

Colorimetric Estimation of Bismuth. PAUL PLANÈS (*J. Pharm. Chim.*, 1903, [vi], **18**, 385—389).—The method depends on the fact that, in the presence of glycerol, potassium iodide does not precipitate solutions of bismuth salts, but gives a yellow solution. Standard solutions are prepared by dissolving 1 gram of pure metallic bismuth in 3 c.c. of nitric acid and 2·8 c.c. of water and diluting the solution to 100 c.c. with glycerol. Five grams of potassium iodide are also dissolved in 5 c.c. of water and diluted to 100 c.c. with glycerol. Ten c.c. of each of these solutions, when mixed in a graduated tube and diluted to 50 c.c. with a mixture of glycerol and water, form the standard with which the comparisons are made. Sufficient of the bismuth salt to be estimated is taken to give an approximately 1 per cent. solution of bismuth when dissolved in nitric acid and made up with glycerol.

Conversely, the method serves for the estimation of iodides.

W. P. S.

Separation and Estimation of Iron and Phosphoric Acid in Water. HENRI CAUSSE (*Compt. rend.*, 1903, **137**, 708—710).—Both iron and phosphoric acid are present in potable waters in the form of complex ions. The most suitable reagent is the compound of mercuric chloride with sodium *p*-aminobenzenesulphonate (Abstr., 1900, ii, 457—458), which precipitates the iron as ferric hydroxide and the phosphoric acid as mercuric phosphate. After 24 to 36 hours, the clear liquid is decanted, and the precipitate is dissolved in hydrochloric acid, a residue of mercurous chloride remaining in the case of impure waters. The solution is evaporated to dryness and the residue fused with sodium carbonate. The iron and phosphoric acid are then separated in the usual way. C. H. D.

Evaluation of Oil of Cloves. HERMANN THOMS (*Arch. Pharm.*, 1903, **241**, 592—603).—The method of evaluation published by the author (*Ber. Deut. pharm. Ges.*, 1891, 1, 278 ; Abstr., 1892, 250) has been examined in the light of subsequent publications. It is found that the original method accounts for most of the eugenol present as acetate or benzoate; but a modification of the method is described which obviates any error due to the presence of eugenol esters. For rough estimations, the simpler method of Umney is permissible (*Pharm. J.*, 1895, **25**, 950. Compare also Spurge, *ibid.*, 1903, Nos. 1717 and 1718).

In the modified method, about 5 grams of the oil are warmed with 20 grams of 15 per cent. aqueous sodium hydroxide for half an hour in a beaker on the water-bath; the mixture is then transferred to a separating funnel, the aqueous layer run off, and the residual oil washed twice with 5 c.c. of the sodium hydroxide. To the united alkaline liquid, in a beaker, 6 grams of benzoyl chloride are added; the whole is shaken, and then warmed to destroy the excess of benzoyl chloride. After cooling, the solidified benzoyleugenol is filtered off and rinsed back into the beaker with 50 c.c. of water. The liquid is warmed until the crystals have melted together, and when the cake has become cold and solid again, the water is filtered off; this washing with 50 c.c. water is repeated twice more. Then 25 c.c. of 90 per cent. alcohol are added to the cake in the beaker, heat is applied until the solid has dissolved, and the beaker is swayed gently round for a few minutes as the contents cool, until the benzoyleugenol has separated out in small crystals. The liquid is then cooled to 17° and filtered through a 9 cm. filter previously dried at 101°, the filtrate (about 20 c.c.) being collected in a graduated cylinder. The crystals are washed with so much more of the alcohol that the total filtrate amounts to 25 c.c., and then crystals and filter are brought into a weighing-glass, dried at 101°, and weighed. If a is the weight of benzoyleugenol found, b the weight of oil of cloves taken, the total percentage of eugenol in the oil, as such and in the form of esters, is $61{\cdot}2(a+0{\cdot}55)/b$, since 0·55 gram is the weight of benzoyleugenol which dissolves in 25 c.c. of 90 per cent. alcohol at 17°.

If it is desired to estimate the free eugenol present, 5 grams of the oil are dissolved in 20 grams of ether, the solution shaken rapidly with 20, 5, and 5 grams in succession of 15 per cent. aqueous sodium hydroxide, and the united alkaline liquids treated with benzoyl chloride, &c., as in the other case.

A sample of the oil, distilled by the author from material which had been grown in the botanical garden at Victoria in the Cameroons, was found to contain 79·9 per cent. of eugenol, of which 9·0 was present in the form of esters. C. F. B.

Detection of Methyl Alcohol when Mixed with Ethyl Alcohol. Leonard D. Haigh (*Pharm. Rev.*, 1903, **21**, 404—406).—Prescott's method (Abstr., 1901, ii, 581), modified according to a suggestion by Mulliken and Scudder (Abstr., 1901, ii, 43), was found to give trustworthy results. This modification consists in carefully boiling the liquid in the test-tube, after the treatment with the copper spiral, until the odour of acetaldehyde just disappears. The test for formaldehyde is then applied to the remaining solution. W. P. S.

Estimation of Methoxy- and Methylimino-groups. Guido Goldschmiedt and Otto Hönigschmid (*Monatsh.*, 1903, **24**, 707—719. Compare Abstr., 1903, ii, 578; Busch, Abstr., 1902, i, 501).—When heated with hydriodic acid, the methylbetaines of quinolinic, pyridine-2 : 3 : 4-tricarboxylic, papaverinic, and pyropapaverinic acids, derivatives of pyridine containing the grouping ·CO·C·NMe·, as also methylanthranilic acid, yield part of the methyl attached to nitrogen, as methyl iodide, the more completely the greater the number of carboxyls present. Papaveraldine methiodide yields little if any of the *n*-methyl as methyl iodide (Decker, Abstr., 1903, ii, 763). Sarcosine, betaine, creatine, creatinine, and methylaminoacetophenone yield no methyl iodide with hydriodic acid. G. Y.

Estimation of Glycerol and the Methoxyl Group. Milan J. Stritar (*Zeit. anal. Chem.*, 1903, **42**, 579—590).—A simple and compact apparatus is described for carrying out Zeisel's process (Abstr., 1902, ii, 111, 518), by which the use of tepid water in the condenser jacket can be dispensed with (compare Hewitt and Moore, Trans., 1902, **81**, 318). A rapid method of collecting and drying the silver iodide is also described. In place of red phosphorus for the absorption of hydrogen iodide, a strong solution of sodium antimonyl tartrate has given good results. It also serves to indicate the presence of sulphur compounds, without, however, enabling the method to be used when sulphur is present. M. J. S.

Estimation of Glycerol in Wines by the Iodide Method. Simon Zeisel and Richard Fanto (*Zeit. anal. Chem.*, 1903, **42**, 549—578. Compare Abstr., 1902, ii, 111, 585).—Wine is prepared for the estimation as follows: 100 c.c. are treated with a small excess of tannin and barium acetate and distilled (avoiding contact with caoutchouc) until 70 c.c. have passed over; the residue is made up to 50 c.c. (or 100 c.c. in the case of sweet wines), of which 5 c.c. are used for the estimation. Special experiments show that the alcohol and esters are completely removed, whilst no glycerol is lost. The method is inapplicable in its present form to wines in which any considerable quantity of mannitol is present. The influence of *iso*butylene glycol, which probably occurs as a normal constituent of wine in about the proportion of 7·5 to 100 of glycerol, has not yet been studied. Although sugar by itself yields small amounts of volatile iodides, which precipitate silver, it appears to cause a compensating loss in the glycerol estimation, so that the process is applicable to sweet wines. Experiments with the above process, side by side with Pasteur's alcohol-ether method, show that the loss of glycerol in the latter is so large, and the product is so impure, that no comparison can be made of wines analysed by the different methods. M. J. S.

Spontaneous Alteration of Fehling's Solution. Leopold Rosenthaler (*Arch. Pharm.*, 1903, **241**, 589—593).—If acid is added to Fehling's solution which has been kept for a time, a slight precipitate of cuprous oxide is formed before the alkalinity is all removed; this dissolves in excess of acid, but if excess of alkali is then added and the solution boiled it reappears. Such a solution contains tartronic acid; this must have resulted from the further oxidation of dihydroxytartaric acid first formed, and in fact the behaviour of an old Fehling's solution is just like that of a fresh solution to which some sodium dihydroxytartrate has been added. Formic acid was also detected in solutions from $\frac{1}{4}$—$\frac{1}{2}$ year old, but not in solutions 3 weeks and more than a year old respectively; oxalic acid could not be detected with certainty.

In practice, freshly mixed Fehling's solution should always be used if possible. If an old solution has to be added to an acid liquid, the latter should first be made alkaline, and the solution should be tested to see that it does not give a precipitate when merely boiled by itself.

C. F. B.

Quick Method for the Estimation of Sugar in Urine. EMIL C. BEHRENDT (*Ber.*, 1903, **36**, 3390—3399).—The basis of the methods tried consists in adding a given volume of urine to a suitable solution and estimating the dextrose present by measuring the volume of the precipitate formed. The method does not give accurate results when the volume of cuprous oxide from Fehling's solution is measured, nor when the volume of mercury obtained from an alkaline solution of mercuric cyanide is measured. In both cases, the precipitates contain appreciable amounts of phosphates.

Better results are obtained when the following solution is employed: 32·747 grams of the basic nitrate, $Bi(NO_3)_2{\cdot}OH,Bi(OH)_2{\cdot}NO_3$, dried at 105°, are mixed with 450 c.c. of $2N$ sodium hydroxide and 50 grams of Rochelle salt. Complete solution results and the whole is made up to a litre. Ten c.c. of this solution are mixed with 10 c.c. of diabetic urine in a graduated tube and boiled for $\frac{1}{2}$ to $\frac{3}{4}$ of an hour. The solution becomes darker in colour and ultimately deep black, and on cooling a precipitate of "bismuthous oxide" settles. A "precipitate saccharometer" has been constructed which is so graduated as to enable not merely the volume of the precipitate, but also the percentage of dextrose present, to be read off directly. Albuminous urines must be boiled, the precipitate filtered off, and the filtrate then examined. All urines containing more than 2 per cent. of sugar are diluted to double the volume before the estimation. The precipitate of "bismuthous oxide" always contains phosphates, but it has been shown that the amount is so small that it may be neglected.

The values obtained by the method either in urine or in aqueous solutions of dextrose are rather lower than those obtained by titration with Fehling's solution, but are sufficiently accurate for clinical purposes.

J. J. S.

Estimation of Raffinose. DAVID L. DAVOLL (*J. Amer. Chem. Soc.*, 1903, **25**, 1019—1028).—The inverted acid solution, prepared according to Clerget's directions, is treated at 69° with powdered zinc. This effects an almost perfect decolorisation, and is preferable to the use of animal charcoal, as it does not cause a loss of raffinose.

L. DE K.

The Dextrins of Pine-Honey. OSCAR HAENLE and ALFRED SCHOLZ (*Zeit. Nahr. Genussm.*, 1903, **6**, 1027—1031).—The so-called "honey-dextrins" found in pine-honey consist of various substances which ferment with difficulty. They may be obtained by fermenting the honey with yeast. A part of these substances is insoluble in 87 per cent. alcohol, and may be precipitated from dilute alcoholic solution with barium hydroxide. The "honey-dextrins" reduce Fehling's solution to a small extent only, but, on inversion, about 30 per cent. of reducing carbohydrates are produced. They have a strong, right-handed polarisation (compare Abstr., 1902, ii, 180). W. P. S.

Estimation of Starch in Yeast. NEUMANN WENDER (*Chem. Centr.* 1903, ii, 852—853; from *Verh. Deutsch. Naturf. Aertze*, 1902, ii, 96—98). —One or two grams of the suspected yeast are mixed in a graduated glass with 10 c.c. of water and 1 c.c. of iodine solution, and then transferred to a special tube. The glass is then rinsed with another 5 c.c. of water, and after adding this to the main portion the whole is whirled for 3 minutes in a special centrifugal apparatus styled "amylometer." The tubes are so graduated that the blue deposit represents at once the percentage of potato starch with 20 per cent. of water. L. DE K.

New Quantitative Method. [Estimation of Wood-fibre in Paper.] NICOLAE TECLU (*Zeit. anal. Chem.*, 1903, **42**, 603—606).—The sharply focused image of an object under the microscope loses distinctness as the distance of the objective from the object is altered, and at a definite distance the image disappears completely. This distance is, however, not the same for all objects, and in the microscopic examination of paper it is found possible to estimate the percentage of wood-fibre by measuring the distance at which the fibres, after staining red with phloroglucinol and hydrochloric acid, cease to be visible. For this purpose, the milled head of the fine adjustment is furnished with a scale, and the object on the stage is kept in motion by clockwork, as the accuracy of the measurement is much increased by observing the point at which the motion of the image can no longer be detected. An empirical constant must be determined for the optical combination in use. M. J. S.

[Analysis of Fats.] ALFRED PARTHEIL and F. FERIÉ (*Arch. Pharm.*, 1903, **241**, 545—569).—This vol., i, 4.

Estimation of Fat in Milk by Centrifugal Methods. J. VAN HAARST (*Milch.-Zeit.*, 1903, **32**, 710—711. Compare Abstr., 1903, ii, 516).—The various centrifugal methods are compared. The Babcock-Lister process always gave too low results. Gerber's method, when properly performed, gave good results, as did also that of Thörner. Adam's process was used as a comparison. W. P. S.

Detection of Heated Milk. MORITZ SIEGFELD (*Zeit. angew. Chem.*, 1903, **16**, 962—963).—A controversy with Utz, chiefly on the employment of "ursol" and persulphates for the detection of milk which has been subjected to heating. L. DE K.

Use of Phenolphthalin for the Detection of Heated Milk. FRANZ UTZ (*Milch.-Zeit.*, 1903, **32**, 722).—The oxidation of phenolphthalin to phenolphthalein, previously described as a test for various ferments, including oxydase (compare Abstr., 1902, i, 514), cannot be used to distinguish between raw and heated milk. The reagent must be gently heated to obtain a coloration with raw milk, and under these conditions heated milk also gives a colour. W. P. S.

Poppy-seed Oil. Franz Utz (*Chem. Zeit.*, 1903, **27**, 1176—1177).—The test with nitric and sulphuric acids (1 : 1) does not properly distinguish between poppy-seed oil and sesamé oil. Nearly all commercial poppy-seed and sesamé oils are more or less mixtures, owing to the presses being used in turn for the extraction of these oils. Poppy-seed oil, extracted from the seed by light petroleum, gave the following iodine numbers (Hübl process): Indian, 153·48; Levantine, 157·52; German, 156·94, whereas supposed pure samples investigated by other authors gave about 137°. Tested in Zeiss's butyrorefractometer, the pure oils showed respectively 78·1°, 78·4°, and 78·4°: sesamé oil showed 73°, and two commercial samples showed 76·7°. The pure oil also showed no polarisation whatever. L. de K.

Estimation of Formaldehyde. Bernhard H. Smith (*J. Amer. Chem. Soc.*, 1903, **25**, 1028—1035).—The author has tried the various recorded processes for the estimation of formaldehyde, and arrives at the conclusion that for dilute samples the only trustworthy methods are the iodometric and cyanide processes as proposed by Romijn (Abstr., 1897, ii, 166). For more concentrated solutions, the Blank and Filkenheimer hydrogen peroxide process, and also Legler's ammonia method, may be employed, but the gravimetric hexamethylenetetramine process and the volumetric aniline method are untrustworthy. L. de K.

Estimation of Formaldehyde in Milk. Bernhard H. Smith (*J. Amer. Chem. Soc.*, 1903, **25**, 1036—1038).—The author agrees with Leonard and Smith (Abstr., 1897, ii, 288) that addition of sulphuric acid accelerates the expulsion of formaldehyde from milk on boiling. If, however, an excess of acid is added, the distillation of the formaldehyde is much retarded.

The following process is recommended: 100 c.c. of milk are introduced into a 500 c.c. round bottomed flask, 1 c.c. of dilute sulphuric acid (1 : 3) is added, 20 c.c. of distillate are collected, and the formaldehyde is determined by the cyanide method (preceding abstract). If the sample is reasonably fresh, the amount found will be practically one-third of that existing in the sample. L. de K.

***p*-Nitrophenylhydrazine as a Microchemical Reagent.** Theodor H. Behrens (*Chem. Zeit.*, 1903, **27**, 1105).—The hydrochloride of *p*-nitrophenylhydrazine is recommended as a microchemical reagent for all aldehydes and ketones, most of which yield characteristic crystalline precipitates. The reaction is of particular value for the microchemical determination of acraldehyde, for which a trustworthy test was still wanting. This is obtained as orange-coloured needles, generally as stellate aggregates, but which may also occur isolated. To apply the test to glycerol, the concentrated liquid is heated in a tube with potassium hydrogen sulphate and a small piece of asbestos to prevent frothing, and a drop of the condensed vapour is then mixed with the reagent (compare Abstr., 1901, ii, 351, and 1903, ii, 246, 455). L. DE K.

Phosphomolybdic Acid, a Characteristic Reagent for the Amino-group. FREDERIC SEILER and A. VERDA (*Chem. Zeit.*, 1903, **27**, 1121—1125).—A lengthy article containing a table showing the action of phosphomolybdic acid on the various amino-derivatives.

The reduction of the reagent caused by some oils and fats must be attributed to the presence of amino-compounds in them. L. DE K.

Iodometric Estimation of Benzidine and Tolidine. ARMAND ROESLER and BORIS GLASMANN (*Chem. Zeit.*, 1903, **27**, 986).—About 5 grams of the base are dissolved in hot water with the addition of 5 c.c. of hydrochloric acid and when cold diluted to 500 c.c. Twenty-five c.c. of this solution are neutralised with solution of sodium hydrogen carbonate until a slight precipitate forms, which is then redissolved by means of a drop of very dilute hydrochloric acid. The liquid is now diluted to 500 c.c. and $N/20$ iodine is then slowly added while stirring until no further precipitate is produced and a drop of the supernatant liquid gives a blue spot on starch-paper: 254 parts of iodine represent 184 parts of benzidine or 211·6 parts of tolidine. L. DE K.

Identification of Alkaloids. P. KLEY (*Rec. trav. chim.*, 1903, **22**, 367—384).—The author proposes to apply a slightly modified form of the microscopic method of determining the refractive index of crystals, by immersion in an indifferent liquid of known refractive index, to the detection of alkaloids, especially in toxicological work. The refractive indices of a number of suitable liquids and those of the crystals of a large number of the common alkaloids are given in the original. From the results, the author deduces the conclusion that certain commercial brands of various alkaloids are not homogeneous.

T. A. H.

Comparison of Chemical and Physiological Methods of Assaying Aconite. A. B. STEVENS (*Pharm. Arch.*, 1903, **6**, 49—55).—Ten grams of aconite root are macerated for four hours in 75 c.c. of a mixture of alcohol (7 vols.) with water (3 vols.) and then percolated with the same solvent until 150 c.c. of solution are obtained. This, mixed with 5 grams of powdered pumice stone, is evaporated on a dinner plate heated by a water-bath, and the residue dissolved as far as possible in 5 c.c. of $N/10$ sulphuric acid diluted with 10 c.c. of water, the insoluble matter being washed with 40 c.c. of water. The filtrate is made alkaline by the addition of 2 c.c. of ammonia solution and the liberated alkaloid extracted with ether. The residue left after distilling off the ether is dissolved in 3 c.c. of $N/10$ sulphuric acid and the solution titrated with $N/50$ alkali, using hæmatoxylin as an indicator. Similar methods are described for the assay of aconite preparations, and these are stated to give trustworthy results except in the case of extracts which have been heated in the course of preparation. Results of the same order are obtained by determination of the dilution necessary to inhibit the causation of a tingling sensation when a drop of an aconite preparation is applied to the tip of the tongue (Squibb's test), and by observation of the toxicity of aconite preparations towards frogs, but owing to the variation in sensibility of frogs, this physiological test is untrustworthy. T. A. H.

Assay of Crude Cocaine. William Garsed (*Pharm. J.*, 1903, [iv], **17**, 784—791).—An account is given of a large number of experiments carried out with the object of devising a method for assaying the crude alkaloid obtained from different kinds of coca leaves. A comparison was made of the chemical and physical properties of the four alkaloids, cocaine, cinnamylcocaine, truxilline, and tropacocaine, and of their hydrolytic products, namely, benzoic, cinnamic, and truxillic acids. As a result of these experiments, it was found that the proportions of the different alkaloids present in the crude material may be ascertained by either of the following processes.

In the first process, a weighed quantity of the crude alkaloid is dissolved in dilute sulphuric acid and treated with potassium permanganate. The cinnamylcocaine is thus destroyed, whilst the cocaine and truxilline remain unaffected and are recovered by adding excess of ammonia and extracting with ether. The unoxidised alkaloid is weighed, and the loss in weight represents the amount of cinnamylcocaine originally present. The re-extracted alkaloid is hydrolysed by heating it with alcoholic potassium hydroxide, and the truxillic and benzoic acids are separated from one another by taking advantage of the insolubility of the former in water. From the quantity of each acid found, the respective amounts of truxilline and cocaine can be calculated.

In the alternative process, the crude alkaloid is submitted to alkaline hydrolysis. The cinnamic acid is estimated by acidifying the product with sulphuric acid and adding excess of solution of bromine, $2\frac{1}{2}$ mols. of bromine being absorbed by each molecule of cinnamic acid. The excess of bromine is removed by means of potassium iodide, and the liberated iodine is titrated with sodium thiosulphate. The benzoic and truxillic acids are not affected by this treatment and are separated from one another by means of the insolubility of the latter in water. The amounts of truxilline and cinnamylcocaine are then calculated, and the quantity of cocaine in the crude alkaloid is found by difference.

The first process is preferable to the second, since in the former case the amount of cocaine present is ascertained by direct estimation of the benzoic acid, whilst in the latter it is determined by difference.

E. G.

Test for Choline in Blood. Richard W. Allen and Herbert French (*Proc. physiol. Soc.*, 1903, xxix—xxx; *J. Physiol.*, 30).—The mere obtaining of yellow, octahedral crystals by the addition of platinum chloride to an alcoholic extract of blood is by itself no proof of the existence of choline. Ammonium and potassium platinichlorides have a similar crystalline form, and the use of absolute alcohol does not exclude these in small amounts. In order that the test may be of clinical value, some solvent must be discovered which excludes ammonium and potassium salts. W. D. H.

Xanthine Bases contained in Meat, Yeast, and other Extracts. I. The Xanthine Bases of Meat Extract. KARL MICKO (*Zeit. Nahr.-Genussm.*, 1903, 6, 781—791).—The present researches were undertaken for the purpose of separating the xanthine bases in meat extract from one another, and further to ascertain whether the same bases occur in meat and vegetable extracts. For the extraction of the total mixed bases, the method previously described by the author was used (compare Abstr., 1902, ii, 369). The bases were then decolorised by heating with lead acetate solution and adding ammonia. After removing the excess of lead, the bases were fractionally crystallised, the different fractions being further purified by the lead and ammonia treatment, and then analysed. From the results, it is seen that the xanthine bases of meat extract consist principally of hypoxanthine, xanthine itself being present only in small quantity. Adenine was also found in the last fraction mixed with hypoxanthine, and was separated from the latter by precipitation with picric acid, dissolving the precipitate in hydrochloric acid, and removing the picric acid by extraction with toluene. The bases were then precipitated with ammoniacal silver solution, the free base being obtained from the silver salt, purified by the lead treatment, and recrystallised from water. Carnine and guanine were not detected in meat extract.

W. P. S.

Two Colour Reactions of Yohimbine. G. MEILLÈRE (*J. Pharm. Chim.*, 1903, [vi], 18, 385).—A crystal of the alkaloid is heated in a porcelain basin on a water-bath with a few drops of dilute sulphuric acid (1 : 1) and a trace of sucrose, dextrose, or furfuraldehyde. When a red coloration appears, the basin is removed from the water-bath and its contents cooled. On spectroscopic examination, a large absorption band is seen in the blue part of the spectrum.

A burnt-sienna coloration is obtained by evaporating a solution of the alkaloid in concentrated nitric acid, and treating the residue with ammonia. W. P. S.

Reactions of Methyl-violet and Tropœolin. SCHUMACHER-KOPP (*Chem. Zeit.*, 1903, 27, 1176).—As there seems to be a little confusion as to the behaviour of these indicators towards acids, the author has reinvestigated the matter. Methyl-violet turns green or blue in the presence of hydrochloric, sulphuric, nitric, or phosphoric acid. Boric acid gives no reaction. Of the organic acids, oxalic, tartaric, and lactic acid give a bluish-green coloration: citric acid gives a blue, and acetic acid is quite indifferent.

Tropœolin behaves similarly. Hydrochloric, sulphuric, nitric, and phosphoric acids give a reddish-violet coloration, boric acid gives no reaction. Oxalic and tartaric acids also give this reaction, whilst citric acid gives a yellowish-red, lactic acid a rose, and acetic acid a cherry-red coloration. L. DE K.

Reaction for Fruit Tannin and other Tannins. W. KELHOFER (*Chem. Centr.*, 1903, ii, 1090—1091; from *Schweiz. Woch. Pharm.*, 41, 457—461).—When a drop of fruit or grape wine is boiled with 10 c.c. of concentrated hydrochloric acid or sulphuric acid, the tannin present in the wine yields a violet coloration. Oak- and kino-tannin also give this reaction, but the tannic acids contained in gall apples, moringa, or coffee do not. The coloration is not obtained when formaldehyde is present, and aliphatic aldehydes more or less affect its formation. The colouring matter is dissolved by ether, forming a reddish-violet solution, but the substance appears to be stable only when dissolved in concentrated acid. Sulphur dioxide and plant acids have no effect on the reaction. The coloration may possibly serve as a basis for a colorimetric method of estimating the tannin in wine. A violet coloration, which probably also depends on the presence of tannin, is formed when freshly cut sections of young pears are treated with fuming hydrochloric acid at the ordinary temperature. E. W. W.

Estimation of Indican in Urine. JACOB BOUMA (*Zeit. physiol. Chem.*, 1903, 39, 356—374).—A critical examination of the methods adopted for the estimation of indigo compounds in urine. The recent work of Maillard (Abstr., 1903, ii, 563) is considered to confirm the author's views. W. D. H.

Estimation of Indican in Urine. L. MONFET (*Compt. rend. Soc. Biol.*, 1903, 55, 1251—1252).—One hundred c.c. of urine, 100 c.c. of hydrochloric acid, and 50 c.c. of hydrogen peroxide are warmed to 50° and shaken with 40 or 50 c.c. of chloroform. The chloroform extract is evaporated, boiled with 10 per cent. nitric acid, and rendered alkaline with potassium carbonate. The phenol so formed is estimated colorimetrically with potassium picrate; 100 parts of phenol is equivalent to 140 of indigotin. W. D. H.

Improved Method for Estimating Indigotin with Sodium Hyposulphite. ARTHUR BINZ and AUGUST KUFFERATH (*Chem. Centr.*, 1903, ii, 398; from *Färberzeit.*, 14, 225—226).—The hyposulphite solution is contained in a burette fitted with a three-way cock, and is delivered through a capillary tube passing through one of the holes of a doubly-bored rubber stopper placed in the neck of a distilling flask of 180 c.c. capacity containing 100 c.c. of the solution of indigotinsulphonic acid to be titrated; through the second hole passes a capillary tube reaching to the bottom of the flask, which allows a current of hydrogen gas to be passed through the solution. The contents of the burette and the solution of hyposulphite are kept in an atmosphere of hydrogen, and a layer of benzene covers the solution in the flask. To carry out an analysis, the burette is filled and the solution allowed to run out through the three-way tap, so that none of it passes into the flask; hydrogen at the same time enters, and in this manner all oxygen is removed from the sides of the burette. Hydrogen is then bubbled through the solution in the flask, and after exhausting with a pump for 5—10 minutes so as to remove traces of oxygen, the titration is carried out in the usual manner.

It is pointed out that, if sulphonation of the indigotin is carried out at 45°, different values are obtained from those which are given by samples sulphonated at 55°, but between 53° and 65° constant numbers are obtained. W. A. D.

Detection of Urobilin. WILHELM SCHLESINGER (*Chem. Centr.*, 1903, ii, 855—856; from *Deutsch. Med. Wochschr.*, 29, 561—563).—In order to obtain a proper reaction for urobilin in urines, it is recommended to clarify them first by adding an equal volume of a 10 per cent. solution of zinc acetate in absolute alcohol; the filtrate will then show a fine fluorescence and distinct absorption spectrum. Zinc chloride should not be substituted for the acetate, and if an aqueous solution of zinc acetate is used the test is interfered with owing to oxidation taking place. If much bilirubin is present, this should be first removed. Fæces are first extracted with ether, then with acidified alcohol, and, after neutralising the acid with ammonia, an equal bulk of the alcoholic zinc solution is added. Blood may be also tested after first removing the blood corpuscles as usual by adding sodium chloride and potassium oxalate and centrifugalising the liquid. The clear plasma is then mixed with the zinc solution and again centrifugalised. L. DE K.

Estimation of Bile Salts in Urine. OTTO GRUNBAUM (*Proc. physiol. Soc.*, 1903, xxvi—xxvii; *J. Physiol.*, 30).—The principle of the method depends on the fact that the addition of bile salts to urine accelerates the flow of the urine in drops through a small orifice. A specially constructed pipette for counting the drops in a given time is described. W. D. H.

Colour Reactions of Proteids. SYDNEY W. COLE (*J. Physiol.*, 1903, 30, 311—318).—Liebermann's test is due to an interaction between glyoxylic acid contained in the ether used in washing the proteid and the tryptophan split off from the proteid by hydrochloric acid. The acid in the ether arises by oxidation through the stage of vinyl alcohol and its isomeride acetaldehyde. The oxidation is effected in sunlight, primarily by the atmospheric oxygen and secondarily by the hydrogen peroxide produced in this way.

Proteids give an intense purple coloration when heated with strong hydrochloric acid and a little cane-sugar or furfuraldehyde, the reaction being due to tryptophan. Sometimes the reaction occurs with hydrochloric or sulphuric acid alone, the furfuraldehyde in this case being formed from the proteid itself. Reichl showed that proteids give a blue coloration when heated with hydrochloric acid, ferric chloride, and benzaldehyde. This is also due to tryptophan. W. D. H.

Detection of Albumin in Urines. ÉMILE DUFAU (*J. Pharm. Chim.*, 1903, [vi], 18, 253—256).—Attention is called to the fact that many urines contain substances which share most of the reactions of true albumin, but are distinguished from it by not being coagulated on boiling the urine and by not giving a decided ring when applying the Heller, or nitric acid test. They are, however, precipitated by addition of acetic and other acids, even partially in the cold, and thus lead to erroneous conclusions. L. DE K.

Moser's Blood Crystals. WALTHER FRIEBOES (*Pflüger's Archiv*, 1903, **98**, 434—451).—Moser's method of obtaining crystals of oxyhæmoglobin consists in allowing the defibrinated blood to become nearly dry, adding water, and waiting for crystals to appear. He states that the crystals so obtained from human blood are different in form from those of other animals, and can be employed for distinguishing human from other blood. In the present research, it was found that crystals prepared from human blood are different in form if the blood is removed during life or after death, different when the amount of blood used is large or small; further differences were found in the blood removed from the splenic vein, and from the umbilical cord of the new-born infant. Such differences show that it is impossible to employ these crystals for diagnostic purposes; moreover, dried or decomposed blood does not give them. A large number of photo-micrographs accompany the article; those of human and other bloods show rhombic plates, needles of varying sizes and groupings, but no essential crystallographic differences. W. D. H.

Van Deen's Reaction for Blood Spots. DIOSCORIDE VITALI (*Gazzetta*, 1903, **33**, i, 323—328).—The author has confirmed experimentally the result obtained by Tarugi (Abstr., 1903, ii, 460) that van Deen's reaction is yielded by thiocyanates as well as by the colouring matter of the blood. It must also be assumed that the action of ozonised turpentine oil on thiocyanates yields either Caro's acid or a similar unstable compound, and the author finds that, on heating potassium persulphate with barium chloride, the following reactions take place:

(1) $K_2S_2O_8 + H_2O = K_2SO_4 + H_2SO_4 + O$.
(2) $2BaCl_2 + H_2SO_4 + K_2SO_4 = 2BaSO_4 + 2KCl + 2HCl$.
(3) $2HCl + O = H_2O + Cl_2$.

In the reaction between potassium thiocyanate, barium chloride, and turpentine oil, however, it has been found impossible to detect the evolution of chlorine, possibly owing to its extremely small amount.

The author does not agree with Tarugi in the opinion that the value of van Deen's reaction for detecting blood is diminished by the fact that it is given also by thiocyanates. For, on the one hand, the latter are never found, except in infinitesimal amount, in blood spots (even when these are formed) of the residue from the evaporation of the urine or saliva, and, on the other, if the thiocyanate is present in larger quantity it can be detected readily by its reaction with ferric salts. T. H. P.

General and Physical Chemistry.

Budde Effect with Reference to Bromine. B. Palmer Caldwell (*Amer. Chem. J.*, 1904, 31, 61—63).—Comparative experiments on the Budde effect in the cases of chlorine and bromine were carried out with the aid of photographic flash-light cartridges. These experiments were of a preliminary nature, and the gases were not perfectly pure or dry. The results showed that the expansion of the bromine was considerably greater than that of the chlorine. The return to the original volume was not immediate, but, on an average, extended through a period of 3 seconds. The rise in temperature was not sufficient to account for the change in volume, especially in the case of bromine. These results confirm the conclusion of Mellor (Trans., 1902, 81, 1291) that there is no evidence to show that chlorine gas under the influence of light undergoes any change capable of appreciably affecting its activity towards hydrogen, and also indicate that the same is true in the case of bromine. If Mellor's second conclusion that the Budde effect is entirely caused by part of the energy absorbed from light being dissipated as heat were true, the rise of temperature should be much greater in the case of bromine than of chlorine, but this is not in accord with the results of the present investigation.

E. G.

Behaviour of Selenium towards Light and Temperature. Robert Marc (*Zeit. anorg. Chem.*, 1903, 37, 459—474).—The applicability of selenium cells for spectrophotometric purposes has been investigated. The course of the action of red and blue light on the cell used is gradual, the maximum influence being attained after from 6 to 7 hours.

The "non-metallic" variety of selenium, the resistance of which increases with increase of temperature, is termed by the author the A modification, whilst the "metallic" variety is termed the B modification. The latter is in general a much better conductor, and is less sensitive to light than the former. When the modification B is heated above 210°, it is transformed into A; when the latter is cooled to −40°, it is transformed into B. B is stable under 8°, A above 70°. At the ordinary temperature, A passes slowly into B, a transformation which is accelerated by white or red light but retarded by blue. The sensibility of selenium towards red and blue light at different temperatures is represented diagrammatically.

The author is of the opinion that the sensibility of selenium to light is not conditioned by the presence of traces of metallic impurities.

A. McK.

Characteristics of Line and Band Spectra. Origin of the Two Spectra. Henri Deslandres (*Compt. rend.*, 1903, 137, 1013—1018).—The paper is largely an historical survey of the theories advanced in explanation of the line and band spectra of elements. Adopting the Lorenz theory that the electric current is due to the movement of electrons, the author suggests (1) that the general band spectra arise from the impact of the electrons on the molecules of the gas, (2) the simpler band spectra (those of the negative pole) are to be attributed to the decomposition of the molecule into simpler molecules or even atoms, and (3) the line spectra are caused by a new series of vibrations arising from the union of the negative electrons with the atoms. M. A. W.

Relation between the Constitution and Absorption Spectra of Rosaniline Dyes. JULIUS FORMÁNEK (*Zeit. Farb. Text. Chem.*, 1903, 2, 473—482).—Derivatives of *p*-diaminotriphenylmethane (malachite-green, brilliant-green, acid-green, patent-blue) give in concentrated solution in all solvents the same absorption spectrum, consisting of a double band with a slight shadow to the right (more refrangible side); in dilute solution, the double band reduces to a weak symmetrical single band. Derivatives of *p*-triaminotriphenylmethane similarly give a spectrum consisting in concentrated solution of a strong double band and a single weak line, and in dilute solution of two single bands, one much feebler than the other. In the latter case, the feeble band may be either to the right or the left of the principal line, according to the nature of the compound.

By introducing successive ethyl radicles into diaminotriphenylcarbinol chloride, the single band of dilute solutions is displaced in the direction of greater wave-length; di-, tri-, and tetra-ethyldiaminodiphenylcarbinol have, for instance, $\lambda = 561{\cdot}4$, $589{\cdot}8$, and $623{\cdot}0$ respectively. Similar displacement takes place in passing from di- to tetra- and hexa-methyltriaminotriphenylcarbinol anhydrochlorides, and the feebler band undergoes also a change in position in the same direction. It is shown that in both diamino- and triamino-triphenylcarbinol dyes the displacement in passing from the unalkylated base to alkylated derivatives is numerically proportional to the number of alkyl groups introduced. Thus the ratio

$$\frac{\text{displacement in passing from base to dimethyl derivative}}{\text{displacement in passing from same base to tetramethyl derivative}}$$

is equal to the same ratio in the case of the diethyl and tetraethyl bases; in the first case, the ratio is 0·4604, in the other, 0·4610. Whence, knowing the position of the bands of the methyl derivatives of a base, that of the ethyl derivatives may be calculated; examples are given, showing that the calculated values agree with those observed within half a wave-length.

In similar compounds, a chlorine atom produces exactly the same proportional displacement of the principal absorption band. In the case of triaminotriphenylcarbinol compounds, the distance between the intense and feeble bands diminishes as the index of refraction of the solvent increases. By comparing the displacement in passing from triaminotriphenylcarbinol anhydrochloride to tetramethylpararosaniline chloride, $NMe_2Cl\colon C_6H_4\colon C(C_6H_4\cdot NMe_2)\cdot C_6H_4\cdot NH_2$, and to benzoyltetramethylpararosaniline chloride,

$$NMe_2Cl\colon C_6H_4\colon C(C_6H_4\cdot NMe_2)\cdot C_6H_4\cdot NHBz,$$

it is seen that the change of position of the strong line is the same in both cases, but that of the weak line different; the values are λ 584·5 and λ 584·5 for the strong line, λ 527·6, λ 514·4 for the weak one. The weak band is thus affected only by changes in the third amino-radicle; by displacing both its hydrogen atoms by benzyl groups its intensity is much increased. The displacement of this band by a benzyl group is, however, much less than that caused by a methyl radicle. The remainder of the paper deals with the effects on the position of the lesser band caused by the radicles benzyl and phenyl being introduced in place of the hydrogen atoms of the third amino-radicle, and the use to which the numerical values obtained can be put in checking the structure of dyes. W. A. D.

Ultra-violet Absorption Spectra of Ortho-, Meta- and Para-isomerides. II. R. MAGINI (*Atti R. Accad. Lincei*, 1903, [v], 12, ii, 260—267. Compare Abstr., 1903, ii, 706).—From the results of his former experiments (*loc. cit.*) and of those now described on the ultra-violet absorption spectra of the isomeric aminobenzoic and phthalic acids, the author draws the following conclusions: (1) all the compounds examined exhibit very strong absorptions. (2) They nearly always show distinct bands, which become displaced towards the luminous part of the spectrum when a hydroxyl group is replaced by either a carboxyl or an amino-group. (3) The introduction of a second carboxyl group into the chain seems to annul completely the increase of absorption and displacement of the bands produced by the first. (4) As regards increase of absorption, especially that exhibited for very high dilutions in the extreme ultra-violet, the isomerides examined always arrange themselves in the order meta, ortho, para. (5) The meta- and ortho-isomerides show, although different, yet analogous absorptions, whilst the corresponding para-compounds exhibit extremely intense absorptions, quite independent of those of the other isomerides.

Hence it is clear that the positions of the groups constituting a molecule have a definite characteristic influence on the absorption of the ultra-violet rays. This influence, manifested in a particular way on the rays of small wave-length, shows that the absorption of a compound cannot be an additive property, as Spring's results for the visible part of the spectrum would indicate. T. H. P.

Ultra-violet Rays and Stereo-chemical Isomerism. R. MAGINI (*Atti R. Accad. Lincei*, 1903, [v], 12, ii, 297—304. See preceding abstract).—From measurements on the absorption spectra of asparagine, the tartaric acids, and maleic and fumaric acids, the author concludes: (1) that stereo-chemical isomerides which exhibit complete concordance in all their properties, with the exception of the rotatory power, which may be different, have, at least, in the compounds examined, perfectly identical absorptions, conditioned by the equality of their molecular dimensions. (2) That stereo-chemical isomerides containing a double linking determining *cis*- and *trans*-modifications, as in maleic and fumaric acids, show, on the other hand, absorptions which are markedly different, but of the same order of magnitude, this behaviour being conditioned by the different configurations of the respective molecules. T. H. P.

Action of Ultra-violet Light on Rare Earth Oxides. CHARLES BASKERVILLE (*Amer. J. Sci.*, 1903, [iv], 16, 465—466).—The oxides of gadolinium, lanthanum, neodymium, praseodymium, cerium, samarium, thorium, yttrium, erbium, uranium, ytterbium, titanium, and zirconium were subjected to the action of ultra-violet light. Zirconium and thorium dioxides were the only two which phosphoresced strongly. Various minerals, containing zirconium and thorium, were also examined, but none of them showed any fluorescence or phosphorescence. A. McK.

Calculation of the Electromotive Force between Elements of the Calomel Element Type. J. N. BRÖNSTED (*Zeit. anorg. Chem.*, 1903, 37, 158—163).—The electromotive force of an element of the calomel element type is expressed by the equation $\pi=\nu(1/n_1+1/n_2)RT/\epsilon_0.\log p_1/p$, where ν is the number of metal atoms contained in 1 molecule of the salt, n the valency of the cathion, and n_2 the valency of the anion. A. McK.

Electric Osmose in Liquid Ammonia. MARCEL ASCOLI (*Compt. rend.*, 1903, 137, 1252—1255).—When a difference of potential is established between two portions of liquid ammonia separated by a porous septum of calcined alumina, and kept at a temperature of −60° by immersion in a bath of acetone cooled with solid carbon dioxide (compare Moissan, Abstr., 1902, ii, 66), there is usually a slight displacement of the liquid in the opposite direction to the current; but if the liquid is coloured blue by the formation of a small quantity of sodammonium in solution (compare Joannis, Abstr., 1890, 209), there is a marked displacement of the liquid in the same direction as the current, showing that the introduction of the sodium has caused the liquid to become positively and the alumina negatively electrified (compare Perrin, *Compt. rend.*, 1903, 136, 1388—1391, 1441—1443; this vol., ii, 8). That liquid ammonia should exhibit the phenomenon of electric osmose is in keeping with its high dielectric constant (compare Goodwin and Kay Thompson, *Phys. Rev.*, 1899, viii, 38) and its ionising property (compare Frenzel, Abstr., 1900, ii, 474). M. A. W.

Heat of Oxidation of Molybdenum. MARCEL DELÉPINE (*Bull. Soc. chim.*, 1903, [iii], 29, 1166—1167).—This constant was determined by the method already described (Delépine and Hallopeau, Abstr., 1900, ii, 8). One gram of molybdenum, when burned to the trioxide, developed in a first experiment 1740·7 cal., and in a second, 1720·6 cal.; whence $Mo(sol)+O_3(gas)=MoO_3(sol)+166{\cdot}14$ Cal. at constant volume, and 167 Cal. at constant pressure.

Molybdenum dioxide burns very slowly to the trioxide, hence it is impossible to determine the calorific value of this reaction.

The heat of formation of molybdenum trioxide is less than that of tungsten trioxide (*loc. cit.*), and this agrees with the observed reactions of the two metals. Thus the oxides of bismuth, antimony, lead, and copper are reduced by molybdenum, and molybdenum oxide is reduced by zinc, but less easily than tungsten oxide, whilst it also accounts for the limited reduction of molybdenum oxides by hydrogen as observed by Guichard (Abstr., 1900, ii, 658). T. A. H.

The Possible Forms of the Melting Point Curve for Binary Mixtures of Isomorphous Substances. II. JOHANNES J. VAN LAAR (*Proc. K. Akad. Wetensch. Amsterdam,* 1903, 6, 244—259. Compare Abstr., 1903, ii, 631).—A mathematical paper unsuitable for abstraction. A. McK.

Distillation under Diminished Pressure in Quartz Vessels. ALOIS SCHULLER (*Zeit. anorg. Chem.*, 1903, 37, 69—74).—Various substances were heated under diminished pressure in vessels of quartz, 22 cm. long and 2 cm. in diameter. It was shown that silver can be volatilised at a temperature below its melting point; a deposit of lead was observed when commercial silver was employed. Copper can be sublimed when heated in quartz vessels. Gold volatilises very slowly at about its melting point. Tin can be distilled somewhat more easily than gold.

Sodium chloride is readily sublimed. Silver sulphide is more readily sublimed than silver. Lead sulphide is very easily sublimed.

The author separated metals by distillation under diminished pressure before Kahlbaum, Roth, and Siedler (Abstr., 1902, ii, 259) did. A. McK.

The Influence of Non-electrolytes on the Vapour Tension of Acetic Acid in Solution. PETRU BOGDAN (*Ann. sci. Univ. Jassy,* 1903, 11, 302—327).—A description of some experiments which were made to ascertain the nature of the influence exerted by different compounds on the vapour pressure of a substance in solution. The actual case studied was that of acetic acid dissolved in benzene. The method employed was to maintain equilibrium between the benzene solution and aqueous acetic acid, and to determine the change in concentration of the latter produced by adding a second substance to the benzene layer. To compare the action of different substances, it is necessary to calculate the relative molecular depression in each case. This value was found to vary considerably; it is very small for toluene and ethylene dibromide, slightly larger for nitrobenzene and chloroform, and of considerable magnitude in the case of ether and the esters of acetic acid. Within certain limits, the molecular depression of each substance is constant; it is only slightly influenced by temperature, but increases with diminishing concentration of acetic acid until a point is reached when it remains constant, whatever the strength of the acetic acid solution.

A theoretical discussion is given of the two general cases (*a*) where the added substance depresses, or (*b*) raises the vapour pressure of the compounding solution. In the former case, it is shown that the two substances contained in the solution must be more soluble in one another than in the solvent, whilst in the second case the reverse holds; the two dissolved substances are less soluble in one another than in the solvent. S. S.

Theory of the Critical State. Difference between Gasogenic and Liquidogenic Substances. Isidor Traube (*Zeit. anorg. Chem.*, 1903, **37**, 225—242. Compare Abstr., 1902, ii, 551).—According to the views of de Heen and of the author, the critical temperature is that at which the complete miscibility of two heterogeneous substances occurs; according to de Heen, those two substances differ from one another in their mass, and, according to the author, in the different space they occupy. The author's hypothesis, which implies a discontinuity of the gaseous and liquid state at the critical temperature, is supported by facts which are quite independent of critical phenomena. In the transformation of a solid and liquid substance into the gaseous form, the value b in van der Waal's equation must undergo a discontinuous and very considerable increase in volume, since the gasogenic particle is considerably greater than the liquidogen particle. The "true" critical temperature is that temperature at which the densities of the gasogenic and liquidogenic particles are identical.

The co-volume, $v-b$, is a function of the pressure and the temperature; the constant b is a function of the pressure, either external or internal; the refraction constant, $\frac{n^2-1}{n^2+2}\cdot\frac{1}{d}$, is likewise dependent on the pressure, but to a less extent than b.

A. McK.

Extension of Clapeyron's Formula to all the Indifferent States. L. Ariès (*Compt. rend.*, 1903, **137**, 1239—1242. Compare Abstr., 1903, ii, 589; this vol., ii, 16).—From mathematical considerations, the author deduces the relation $\delta p/\delta T = \Delta S/\Delta V = \Delta L/T\Delta V$, where ΔS and ΔV denote the variations in entropy and volume, ΔL the latent heat of transformation absorbed by the system, and δp and δT the changes in pressure and temperature. This is Clapeyron's formula generalised, applicable to all the indifferent states, and proves that these states succeed one another in a determined direction if the temperature and pressure in a univariant system, and also the quantities of the constituents in a bivariant system, begin to change; the relation beween the temperature and pressure can be expressed in curve form, and in the case of a system defined by means of its independent constituents every curve of a univariant state is met tangentially by the curves of the bivariant states.

M. A. W.

A New Heating Oven for Sealed Tubes, which can be Shaken. Hermann Thoms (*Ber.*, 1903, **36**, 3957—3958).—The apparatus described and depicted is heated by gas and has the form of an ordinary Carius-oven; it is mounted on trunnions on which it rocks, the movement being produced by a hot air or 1/40 h.p. electric motor. The temperature can be kept constant within 1—2°.

W. A. D

Ionisation in Atmospheric Air. J. A. McClelland (*Sci. Trans. Roy. Dubl. Soc.*, 1903, 8, ii, 57—64. Compare Wilson, Abstr., 1901, ii, 435; Rutherford and Allen, Abstr., 1903, ii, 123).—The author has determined the number of ions present in 1 c.c. of air circulating freely through the apparatus. The number found was of the order 600—700, but there is very considerable variation in the amount of the ionisation. The maximum ionisation observed was about 2·5 times the minimum ionisation observed, the greatest value being obtained after several hours' rain. The radiation emitted by freshly fallen rain (Wilson, Abstr., 1903, ii, 194) is probably responsible for this. The facts, on the whole, point to some radioactive substance disseminated through the atmosphere. J. C. P.

Determination of the Nature of the Dissociation of Ternary Electrolytes by means of Isohydric Solutions. Gottfried Kümmell (*Zeit. Elektrochem.*, 1903, 9, 975—977).—In a solution of magnesium chloride, we must assume the presence of the ions $MgCl^{\cdot}$, $Mg^{\cdot\cdot}$, and Cl' in addition to undissociated molecules. The concentration of the Cl' ions can be determined by finding a solution of potassium chloride, for example, of such concentration that when it is mixed with the solution of magnesium chloride the conductivity of the mixture is the mean of the conductivities of the components. The concentrations of the Cl' ions in the two solutions are then the same. The following values are found in this way:

Gram eq. $MgCl_2$ per litre	2	1·5	1	0·5	0·1	0·05
Gram eq. Cl' per litre	1·133	0·872	0·593	0·310	0·0722	0·0401

The conductivity of a solution of magnesium chloride can be expressed in terms of the concentrations of the ions and their velocities, but the equation so obtained still contains two unknown quantities—the concentration and velocity of the $MgCl^{\cdot}$ ions. By assuming that the most concentrated solution contains only $MgCl^{\cdot}$ and Cl' ions, it is found that the maximum value of the velocity of the $MgCl^{\cdot}$ ion is 23; the true value must therefore lie between 0 and 23. A consideration of the migration constants leads to the conclusion that the velocity is probably smaller than 10, and that the concentrations of the $MgCl^{\cdot}$ ions are roughly represented by the following numbers:

Gram eq. $MgCl_2$ per litre	2	1·5	1	0·5	0·1
Gram eq. $MgCl^{\cdot}$ per litre	0·8	0·45	0·2	0·05	0·00

T. E.

Contribution to the Study of Dissolved Substances, III. Ad. Vandenberghe (*Bull. Acad. roy. Belg.*, 1903, 908—947. Compare Abstr., 1900, ii, 335).—The influence exerted by different substances on the molecular association of compounds in various solvents is studied. By means of the boiling point method, it is shown that the introduction of a fresh substance, either associated or non-associated, to the solution of an associated compound usually causes the association of the latter to increase. The extent to which the association is influenced depends on the solvent used, the temperature, and the concentration of the dissolved substances. The fact that such an influence can be exerted by the presence of foreign material causes the author to abandon his former view that an analogy holds between gaseous dissociation and the dissociation of substances in solution.

S. S.

Polymerisation of Liquid and Solid Inorganic Compounds. GEORGE G. LONGINESCU (*Ann. sci. Univ. Jassy*, 1903, **11**, 288—294. Compare Abstr., 1903, ii, 531).—By means of the relation $(T/C.D)^2 = n$, the author calculates the state of aggregation of about fifty inorganic substances, both liquid and solid; the observations are confined to compounds containing elements having atomic weights below 40. In general, the results agree with those obtained by other observers with different methods. The method cannot be applied to compounds which contain elements of very high atomic weight. S. S.

The Phenomena of Solidification and Transformation in the Systems $NH_4NO_3,AgNO_3$, and $KNO_3,AgNO_3$. H. W. BAKHUIS ROOZEBOOM (*Proc. K. Akad. Wetensch. Amsterdam*, 1903, **6**, 259—262).—With mixtures of ammonium nitrate and potassium nitrate, the transition point of silver nitrate and the first transition point of ammonium nitrate falls in the region where these mixtures are still partially liquid; the two lower transition points of ammonium nitrate are situated in the region where everything has already become solidified. The deposition of silver nitrate from melted mixtures rich in silver takes place according to two lines, which meet each other at 160°; the solidification of ammonium nitrate from mixtures rich in it also takes place along two lines, which meet each other at 125°. The salts are deposited pure and do not yield mixed crystals. From intermediate concentrations, a compound, $NH_4NO_3,AgNO_3$, is deposited, melting at 109·6°. The various phases involved are indicated in a diagram.

The system $AgNO_3,KNO_3$ is simpler in so far that potassium nitrate has only one transition temperature at 126°. The transition point of silver nitrate falls within the partially liquid region. The various regions are also diagrammatically represented. A. McK.

[Phase Rule.] RUDOLF WEGSCHEIDER (*Zeit. physikal. Chem.*, 1903, **45**, 697—699).—Remarks relative to Byk's paper (this vol., ii, 16).

J. C. P.

Observations on the System Zinc Chloride, Ammonium Chloride, and Water. P. A. MEERBURG (*Zeit. anorg. Chem.*, 1903, **37**, 199—221).—The purpose of this research was to determine which combinations of the components, zinc chloride, ammonium chloride, and water, are capable of existence at the ordinary temperature.

The binary systems, NH_4Cl,H_2O; $ZnCl_2,H_2O$; $ZnCl_2,NH_4Cl$, are first considered. The author has investigated the system NH_4Cl,H_2O, under 0°; the cryohydric point is $-16°$, where the solution in contact with ice and solid ammonium chloride contains 19·5 per cent. of ammonium chloride. The results of Dietz on the solubility of zinc chloride in water are recapitulated.

The author has investigated by Schreinemakers's method the isothermals of the ternary system, $ZnCl_2,NH_4Cl,H_2O$, at 0°, 20°, and 30°, and expressed his results graphically. Of the eight double compounds of zinc chloride, ammonium chloride, and water quoted in the literature, only two are capable of existence at the ordinary temperature, namely, $ZnCl_2,2NH_4Cl$ and $ZnCl_2,3NH_4Cl$. The hydrates are capable of existence only at low temperatures, if at all. A. McK.

Negative Catalysis in a Homogeneous System. Alexander Titoff (*Zeit. physikal. Chem.*, 1903, **45**, 641—683. Compare Bigelow, Abstr., 1898, ii, 506).—The oxidation of sodium sulphite by dissolved oxygen takes place very slowly unless a catalytic agent is present. The reaction is of the first order, and the velocity of oxidation is within wide limits independent of the oxygen concentration. Many salts of heavy metals, notably copper sulphate, accelerate the oxidation, and the acceleration is approximately proportional to the amount of the catalyst. Mannitol acts as a negative catalyst, that is, it retards the oxidation of the sulphite, but about 1800 molecules of mannitol are required to counteract the effect of 1 molecule of copper sulphate. An inorganic negative catalyst has been found in stannic chloride (also stannous chloride), which exhibits the greatest retarding effect. The simultaneous effect of a positive catalyst (copper sulphate) and a negative catalyst (mannitol or stannic chloride) has been studied, and the experiments support the view that negative catalysis consists in a counteracting of the effect of positive catalysis. J. C. P.

Remarks on the Fifth Communication of the Committee on Atomic Weights. Clemens Winkler (*Ber.*, 1903, **36**, 4299—4302. Compare this vol., ii, 20).—Polemical. A. McK.

Comparative Studies in the Periodic System. The Various Gradation Stages between Elements. George Rudorf (*Zeit. anorg. Chem.*, 1903, **37**, 177—198).—A theoretical paper which does not admit of abstraction. A. McK.

Determination of the Composition of Chemical Compounds without the Help of Analysis. Gustav Tammann (*Zeit. anorg. Chem.*, 1903, **37**, 303—313).—The knowledge of the equilibrium of heterogeneous systems provides a means of deciding whether two substances form a compound with one another, and of determining the quantitative composition of the compound if it is produced. The method is based on the knowledge of the melting point diagram of two substances, and on the relationship between the properties of the molten mixture of the two substances and their composition; it is applicable in those cases where the mechanical separation of crystals from the molten mass in which they have separated, is practically impossible. Only those instances are considered where no mixed crystals are formed. A. McK.

Variation of Angles Observed in Crystals; especially of Potassium Alum, and Ammonium Alum. HENRY A. MIERS (*Phil. Trans.*, 1903, *A*, **202**, 459—523).—Details of work already described (Abstr., 1903, ii, 472). J. C. P.

Inorganic Chemistry.

Electrolytic Formation of Hydrogen Peroxide. FRANZ RICHARZ (*Zeit. anorg. Chem.*, 1903, **37**, 75—79).—Historical and polemical. The formation of hydrogen peroxide at the anode during the electrolysis of sulphuric acid was first demonstrated by the author. Various statements made by Borneman (Abstr., 1903, ii, 281) are corrected. A. McK.

Density of Chlorine. HENRI MOISSAN and ARMAND BINET DU JASSONEIX (*Compt. rend.*, 1903, **137**, 1198—1202).—Previous determinations of the density of chlorine have given numbers varying from 2·4482 to 2·491. Using the Dumas method, the authors have determined the density of pure chlorine obtained from sodium chloride purified by repeated crystallisations; the gas was dried in the usual way (Abstr., 1903, ii, 642), then liquefied (Abstr., 1902, ii, 66) and dried by prolonged contact with calcium chloride, and finally solidified in order to expel traces of dissolved gaseous impurities. The density at 0° of the chlorine gas thus purified was found to be 2·490. M. A. W.

Boiling of Sulphur, Selenium, and Tellurium in the Vacuum of the Cathode Light. FRIEDRICH KRAFFT and L. MERZ (*Ber.*, 1903, **36**, 4344—4350).—In a former paper on the boiling points of the metals in the vacuum of the cathode-light (Abstr., 1903, ii, 479), it was shown that selenium and tellurium boil at remarkably low temperatures. More detailed observations have now been made, electrically heated glass vessels being employed, and the temperatures being determined by a thermo-couple. Pure tellurium boils very constantly at 478° under a 58 mm. column of vapour, pure selenium boils at 310° under a 60 mm. column, the temperature rising slightly when rapidly superheated. Sulphur boils under similar conditions at about 140°, and the series of boiling points thus shows a constant difference; $\mathrm{Te} - \mathrm{Se} = 168^\circ$, $\mathrm{Se} - \mathrm{S} = 170^\circ$. The temperatures may readily be determined in glass flasks without an electric furnace, thermometers of borosilicate glass being used. The behaviour of sulphur was studied in greater detail, the sulphur being in some cases heated until it assumed the viscous state. The temperature of both liquid and vapour was measured.

Height of column of vapour.	Temp. of vapour of normally boiling sulphur.	Diff.	Temp. of vapour of colloidal sulphur.	Diff.	Temp. of colloidal sulphur.	Diff.
40 mm.	136—138°	15—14°	183—187°	16—15°	204—208°	19—17°
115 ,,	151—152		199—202		223—225	

The existence of the colloidal variety of sulphur is thus dependent on the pressure. The superheated vapour above the colloidal sulphur is influenced by the pressure of the column of vapour to the same extent as that from normal sulphur. C. H. D.

Formula of Caro's Acid. MARTIN MUGDAN (*Zeit. Elektrochem.*, 1903, **9**, 980).—Referring to Price's results (Trans., 1903, **83**, 543), the author points out that his own experiments (Abstr., 1903, ii, 640) do not decide between the formulæ H_2SO_5 (monobasic) and $H_2S_2O_9$ (dibasic). T. E.

Behaviour of Tellurium Compounds on being heated with Ammonium Chloride. ALEXANDER GUTBIER and FERDINAND FLURY (*Zeit. anorg. Chem.*, 1903, **37**, 152—157).—When tellurium dioxide, telluric acid, or its alkali salts are heated with ammonium chloride, the mixture becomes yellow and then orange, whilst a white sublimate is formed. The mixture on being further heated, assumes a dark colour with the formation of a yellow sublimate, which blackens on careful heating. Tellurium finally remains as a brittle mass. These phenomena do not occur when ammonium chloride is replaced by ammonium nitrate, carbonate, sulphate, phosphate, acetate, or molybdate. The white sublimate obtained consisted partly of ammonium chloride and partly of the additive product, $TeO_2,2HCl$. The black sublimate is probably a compound of tellurous chloride and ammonia, possibly $TeCl_2,2NH_3$. A. McK.

Synthesis of Ammonia. HERMANN CHARLES WOLTERECK (D.R.-P. 146712).—A mixture of hydrogen, nitrogen, and oxygen, or of atmospheric air with a gas containing hydrogen, such as water-gas, is passed over ferric oxide heated to low redness. The most suitable contact material is iron wire gauze which has been thoroughly oxidised. A mixture of equal parts of air and water-gas, containing a little steam, yields ammonia corresponding with 6·3 per cent. of the hydrogen employed. When coal-gas is used, the product which contains amines, must be purified by passing through a concentrated solution of alkali hydroxide.

The influence of ferric oxide in bringing about the combination of hydrogen and nitrogen is not merely catalytic, as the presence of oxygen is found to be essential to the reaction. C. H. D.

Nitrohydroxylaminic Acid. ANGELO ANGELI and FRANCESCO ANGELICO (*Gazzetta*, 1903, **33**, ii, 245—252).—Although the alkali salts of nitrohydroxylaminic acid, the salts of the alkaline earths, and of some of the heavy metals have been prepared, all attempts to prepare esters have failed. The silver salt, which is very unstable in neutral solution, can be obtained as a yellow powder by precipitating the sodium salt with silver nitrate in presence of a small quantity of acetic acid at 0°. On raising the temperature, it decomposes according to the equation $OAg{\cdot}N{:}NO{\cdot}OAg = NO_2Ag + NO + Ag$; practically no hyponitrite is formed, although in the case of the sodium salt this is the principal product of decomposition. The free acid, on the other hand, decomposes according to the equation $H_2N_2O_3 = H_2O + 2NO$. There are thus six modes of decomposition of the acid and its salts: (1) $H_2N_2O_3 = 2NO + H_2O$; (2) $H_2N_2O_3 = HNO_2 + \colon N \cdot OH$; (3) $H_2N_2O_3 = HNO_2 + NO + H$; (4) $H_2N_2O_3 + H_2O = NH_2OH + HNO_2 + O$; (5) $2H_2N_2O_3 = 2HNO_2 + (NOH)_2$; (6) $2H_2N_2O_3 = 2HNO_2 + N_2O + H_2O$; (1) refers to the free acid; (2) to the sodium salt in presence of aldehydes, &c.; (3) to the silver salt alone; (4) to the hydrolysis of the hydroxamic acids formed by addition of the NOH to aldehydes in (2); (5 and 6) to the sodium salt.

Attempts to prepare nitrohydroxylaminic acid from hydroxamic acids by the reaction $OH \cdot CR \colon N \cdot OH + NO \cdot OH = OH \cdot NO \colon N \cdot OH + R \cdot CHO$ gave no issue.

Not only does nitrohydroxylaminic acid readily give up nitroxyl to aldehydes (this vol., i, 172), but the same is true of hydroxylamine-sulphonic acids of the type $R \cdot SO_2 \cdot NH \cdot OH$ (compare Abstr., 1902, i, 765). On the other hand, hyponitrous acid in the form of its sodium salt, which should react as 2NOH, fails to form hydroxamic acids with aldehydes or tetrazones with secondary bases. The authors compare the inactivity of $HO \cdot N \colon N \cdot OH$ with that of molecular oxygen, $O \colon O$.

W. A. D.

Preparation of Nitrites by the Electrolytic Reduction of Aqueous Solutions of Nitrates. Erich Müller and Julius Weber (*Zeit. Elektrochem.*, 1903, 9, 955—967).—The platinum anode is enclosed in a porous pot in order to avoid oxidation of the nitrite formed. Smooth cathodes of platinum and copper are depolarised by solutions of sodium nitrate and of sodium nitrite, the latter being somewhat the better depolariser, although the results obtained are rather variable. With these cathodes, the electrolytic reduction yields a mixture of nitrite and ammonia.

A platinised platinum cathode is depolarised much more completely by a solution of sodium nitrite than by a solution of sodium nitrate, and the electrolytic reduction of a nitrate, therefore, yields much ammonia and very little nitrite. A cathode of spongy copper gives quite a different result, the depolarisation by nitrate being much more complete than that by nitrite. The depolarising effects of both solutions diminish, however, as the electrolysis is prolonged, their relative values finally being reversed. A momentary reversal of the current, however, brings them back to their initial values, and in this way a solution of sodium nitrate may be reduced to nitrite, and the formation of ammonia almost entirely avoided. The best current efficiency is obtained with a current density at the cathode of 0·0025 ampere per sq. cm., and a slightly alkaline solution of sodium nitrate containing 2·27 gram-mols. per litre; 66 per cent. of the nitrate in this solution was reduced to nitrite with a current efficiency of 90·8 per cent. The loss occurs mainly at the anode. Spongy copper slowly reduces nitrate to nitrite by a purely chemical process; the bearing of this fact on the difference between the behaviour of platinum and copper cathodes is discussed.

T. E.

Electrolytic Preparation of Nitrites from Nitrates. Wolf Johannes Müller (*Zeit. Elektrochem.*, 1903, **9**, 978).—The experiments are made with an amalgamated copper cathode, a platinum anode surrounded by a porous pot, a solution of sodium nitrate saturated at 80—90°, and a current density at the cathode of 0·005 to 0·01 ampere per sq. cm. The current efficiency was 85 to 92 per cent. until about 30 per cent. of the nitrate had been reduced to nitrite, but when 50 per cent. had been reduced, the current efficiency fell off to about 40 per cent. Attempts to separate the nitrate and nitrite by fractional crystallisation failed, the two salts crystallising together.

T. E.

Ionisation of Phosphorus. Eugène Bloch (*Compt. rend.*, 1903, **137**, 1040—1042. Compare Abstr., 1903, ii, 206).—The value of a, the coefficient of recombination of phosphorus ions in a current of air which has passed over phosphorus, is 1000 times more feeble than the corresponding coefficient for the case of ionisation by the Röntgen rays. The value of ϵ, the ratio of the number of recombinations to the total number of collisions between the ions of opposite signs (compare Langevin, Abstr., 1902, ii, 301), lies between 0·7 and 1. The independent measurements of the mobility (Abstr., 1903, ii, 206), of the coefficient of recombination, and of the ratio ϵ for the ions of phosphorus give perfectly concordant results, which affords strong evidence in favour of a true ionisation. M. A. W.

Phosphorus. II. Rudolf Schenk (*Ber.*, 1903, **36**, 4202—4209. Compare Abstr., 1903, ii, 363).—The black substance formed by the action of piperidine on solid hydrogen phosphide, on analysis gives figures between those required by the formula $P_4H_2(C_5H_{11}N)$ and $P_5H_2(C_5H_{11}N)$; that is, it is a salt of the hydride, P_4H_2, containing a small quantity of phosphorus; the results previously obtained were due to the piperidine used not being sufficiently dried. The black ammonium salt previously described has the composition P_4H_2,NH_3. The fact that ammonia produces no black coloration with solid hydrogen phosphide is due to the small velocity with which the change takes place; on warming slightly, the black colour appears. The measurements previously made in studying the conversion of white phosphorus into red have been repeated and the change is now shown to be unimolecular; the previous false assumption of a bimolecular change was caused by the mechanical removal of the catalytic agent, phosphorus iodide, from the solution by the red phosphorus.

E. F. A.

Solubility of Arsenic and the Molecular Condition of the Solution. Ludwik Bruner and Stanislaw Tolloczko (*Zeit. anorg. Chem.*, 1903, **37**, 455—458).—By means of the apparatus previously described (Abstr., 1903, ii, 470), the authors have determined the solubility of arsenious oxide in water. The equilibrium between the oxide and the solution established itself slowly in every case. The molecular weight of arsenious acid in aqueous solution is expressed not by $As_2O_3 + xH_2O$, but by $\frac{1}{2}As_2O_3 + yH_2O$. A. McK.

Action of Magnesium Oxide on a Mixture of Arsenic Trisulphide and Sulphur. WILLIAM FOSTER, jun. (*Zeit. anorg. Chem.*, 1903, 37, 59—68).—When magnesium oxide acts on a mixture of arsenic trisulphide (1 mol.) and sulphur (2 atoms) in presence of water, traces of magnesium monothio-oxyarsenate are formed together with magnesium thioarsenate and magnesium dithio-oxyarsenate (McCay, Abstr., 1902, ii, 135). The author has made a further study of McCay's work in this direction.

By the action of magnesium oxide on a mixture of arsenic trisulphide and sulphur in aqueous suspension, a mixture of compounds is formed, the relative proportions of which depend on the experimental conditions. At the ordinary temperature a small amount of monothio-oxyarsenic acid is formed, and a large amount of *trithio-oxyarsenic acid*, of which the *sodium* salt, $Na_3AsOS_3,9H_2O$, was isolated. Dithio-oxyarsenic and thioarsenic acids were also present. The amount of monothio-oxyarsenic acid formed increases with rise of temperature during the interaction, whilst at 70° more dithio-oxyarsenic acid is present than at 100°. A. McK.

Boric Acid and Arsenious Acid. A Study on the Formation of Complexes. FRIEDRICH AUERBACH (*Zeit. anorg. Chem.*, 1903, 37, 353—377).—Dilute borax solutions, in addition to sodium ions, contain monoborate ions and free boric acid, whilst in more concentrated solutions the latter form complex polyborate ions, which are broken up by addition of water or sodium hydroxide. In order to determine the amount of free boric acid in such solutions, the author allows boric acid to compete with another weak acid, arsenious acid, in the presence of an insufficiency of base.

Arsenious acid is soluble in amyl alcohol; it distributes itself between amyl alcohol and water in the constant proportion 1 : 5·47. With excess of arsenious acid, arsenite ions unite to form diarsenite ions and, possibly, also more complex ions. The tendency to the formation of complexes is only moderately great, so that at 25°, with an excess of $0·2N$ arsenious acid, at least half of the salt is in the form of monoarsenite.

Diarsenious acid is a stronger acid than arsenious acid, but is capable of existence in the free state only in very small concentrations. The electrolytic dissociation constant of the complex acid is in the same proportion to that of the simple acid as the constant for the decomposition of the complex of the undissociated acid is to that of its ion. Borate ions unite with excess of boric acid to form polyborate ions; the tendency of the formation of such polyborate ions is great. The type of polyborate ion depends on the concentration of the boric acid in the solution; in the presence of saturated boric acid solutions at 25°, the complexes on an average contain 5 atoms of boron to 1 electron. The polyboric acids are stronger than monoboric acid and than arsenious acid, and they are capable of existence in the free state at low temperatures and in high concentrations.

In a mixture of boric and arsenious acids containing an insufficiency of sodium hydroxide for complete neutralisation, a complicated condition of equilibrium is established between the two simple acids, several complex acids, and their salts. The relationship in amount of the total borate to the total arsenite in such a solution is accordingly dependent on the extent to which both acids form complex compounds. A. McK.

Thomsen's Supposed Synthesis of Carbon Monosulphide, CS. ALFRED STOCK and HANS KÜCHLER (*Ber.*, 1903, **36**, 4336–4339).—The increase in the volume of the nitrogen observed by Thomsen in his experiments (Abstr., 1903, ii, 288) is shown to be due not to the formation of carbon monosulphide but simply to carbon disulphide vapour, the tension of which is high because of the temperature due to the proximity of the heated tube; that this is so can be shown by cooling the gas in liquid air, when solid carbon disulphide is obtained. There is also present a considerable quantity of carbon dioxide, which on cooling solidifies; its presence is due to the fact that metallic copper is never free from oxide, which oxidises some of the carbon disulphide employed. W. A. D.

Distillation of Hydrofluosilicic Acid. EMIL BAUR (*Ber.*, 1903, **36**, 4209—4214).—Hydrofluosilicic acid solutions of different concentrations were distilled and the amount of hydrofluoric, hydrofluosilicic, and silicic acids in the distillate estimated in each case. An acid containing 13·3 per cent. of hydrofluosilicic acid gives a vapour, the composition of which is exactly expressed by the formula H_2SiF_6. The distillate from more concentrated acids contains silicic acid, whilst dilute acids yield a distillate containing hydrogen fluoride; further, concentrated acids dissolve silicic acid when evaporated with it, whereas dilute solutions deposit this acid on evaporation. An acid containing 30·2 per cent. of hydrofluosilicic acid boils at 108·5° under 720 mm. pressure. E. F. A.

Vapour Density of Hydrofluosilicic Acid. EMIL BAUR and ARTHUR GLAESSNER (*Ber.*, 1903, **36**, 4215—4218).—The volume of a weighed amount of hydrofluosilicic acid was measured at various pressures at temperatures of 23°, 31·5°, and 42°. Under the conditions of the experiment, the observed molecular weight was roughly 80, showing that more than half of the hydrofluosilicic acid was dissociated, and it is probable that at 100° more than two-thirds are dissociated.

E. F. A.

Action of Hydrogen Sulphide on Silicon Tetrabromide in presence of Aluminium Bromide; Formation of Silicon Thiourea from Silicon Thiobromide. MARTIN BLIX (*Ber.*, 1903, **36**, 4218—4220).—*Silicon thiobromide*, $SiSBr_2$, formed by the interaction of silicon tetrabromide and hydrogen sulphide at 150° in presence of aluminium bromide, boils without decomposition at 150° under 18·3 mm. pressure and solidifies to large, colourless plates melting at 93°. When dry ammonia is passed through its benzene solution, a mixture of *silicon thiourea* [*silicon thiodiamide*] and ammonium bromide is precipitated, from which the soluble ammonium bromide is extracted with liquid ammonia. Silicon thiourea is a colourless, amorphous powder relatively stable in the air; it has basic properties and forms salts with the halogen acids.

Pure silicon tetrabromide melts at +5° and boils at 150·8° under 751·4 mm. pressure. E. F. A.

Silicon Thiochloride, Silicondi-imide, Silicam, and Silicon Nitride. Martin Blix and W. Wirbelauer (*Ber.*, 1903, **36**, 4220—4228).—Silicon tetrachloride and hydrogen sulphide form a compound $SiCl_3 \cdot SH$ (Pierre, *Ann. Chim. Phys.*, 1848, [iii], **24**, 286; Friedel and Ladenburg, *Annalen*, 1868, **145**, 179), boiling at 96°; this, when heated to a higher temperature by passing through a glass tube at a dull red heat, the apparatus being so arranged that the gases continually circulate in a closed circuit, is converted into *silicon thiochloride*, $SiSCl_2$, which crystallised from chloroform, melts at 75°, and distils at 92° under 22·5 mm. pressure; it is very easily decomposed by moisture or by distillation at the ordinary temperature into silicon disulphide and silicon tetrachloride. Liquid anhydrous ammonia reacts with either silicon disulphide or still more readily with the thiochloride forming *silicondi-imide*, $Si(NH)_2$, but the product always contains 2—3 per cent. of sulphur. The imide is obtained pure by the action of ammonia on the ammoniosilicon chloride, $SiCl_4,6NH_3$, prepared by Persoz (*Annalen*, 1842, **44**, 319); so prepared, it forms a colourless, non-fusible powder which slowly decomposes into silica and ammonia on exposure to air; it has basic properties and forms a relatively stable hydrochloride, $Si(NH)_2,2HCl$. When heated at 900° in an atmosphere of nitrogen, it loses ammonia, forming silicon nitrimide (silicam), Si_2N_3H (compare Schützenberger and Colson, Abstr., 1882, 571), an amorphous powder, which is not acted on by water and when heated at 1200—1300° loses ammonia forming silicon nitride, Si_3N_4. E. F. A.

Coagulation of Colloidal Silicic Acid. Nicola Pappadà (*Gazzetta*, 1903, **33**, 272—276).—Tables are given showing the time of coagulation of 0·6 and 3·9 per cent. solutions of silicic acid. From these it is concluded that the time of coagulation is diminished by increasing the concentration of the coagulating salts, and is dependent on the nature of these. Acids, acid salts, and salts with an acid reaction in solution either fail altogether to coagulate the solutions or, with some concentrated solutions, the coagulation is very slow. Neutral salts cause rapid coagulation, and their effect is greater the greater their molecular weight. Salts with an alkaline reaction are most rapid in their action. W. A. D.

Decomposition of Crystallised Sodium Thiosulphate by Heat. Arthur Jaques (*Chem. News*, 1903, **88**, 295).—When crystallised sodium thiosulphate is heated quickly in a test-tube, hydrogen sulphide is evolved, and sulphur, sodium sulphite, and sodium sulphate are present in the residue. D. A. L.

Electrolytic Preparation of Alkali Selenates. Erich Müller (*Ber.*, 1903, **36**, 4262—4266).—Foerster and Friessner have shown (Abstr., 1902, ii, 488) that during the electrolysis of sulphites, oxidation occurs with the formation not only of SO_4 ions but also of S_2O_6 ions. The author has studied the electrolysis of selenites and has observed that, whilst selenates are readily formed by the electrolytic oxidation, there is no formation of selenium salts corresponding with dithionates.

A neutral solution of sodium selenite is electrolysed until all the selenite has disappeared, that is, until a portion of the electrolyte causes no separation of iodine and selenium with a solution of potassium iodide. The anode consists of platinum foil, the cathode of platinum wire. Sodium selenate is then obtained by simply evaporating the solution, after filtering it from a small amount of selenium. In the presence of potassium chromate, the deposition of selenium at the cathode is entirely prevented. In order to obtain sodium selenate from the latter solution, the chromium must first of all be removed by precipitation, so that, on the whole, the method of preparing the selenate by electrolysing the selenite in the absence of potassium chromate is to be preferred.

When a neutral solution of sodium selenite or of sodium selenate is electrolysed, a slight deposition of selenium on the cathode occurs in both cases, but the deposition ceases after some time.

On electrolysis, faintly alkaline solutions of sodium tellurite and tellurate respectively undergo considerable reduction to tellurium.

A. McK.

Dissociation of Alkali Carbonates. Paul Lebeau (*Compt. rend.*, 1903, **137**, 1255—1257).—Contrary to his original conclusion (compare Abstr., 1903, ii, 477), the author now finds that the carbonates of all the alkali metals are dissociated into carbon dioxide and a volatile alkali oxide by heating them in a vacuum below 800°.

Sodium carbonate begins to dissociate at 700° and can be completely volatilised at 1000°.

Potassium carbonate begins to dissociate at 790° and volatilisation is complete at 1000°.

Rubidium carbonate, prepared from the pure platinichloride through the chloride, sulphate, hydroxide, and hydrogen carbonate, begins to dissociate at 740° and, like the corresponding compound of sodium and potassium, can be completely volatilised at 1000°.

Cæsium carbonate (which forms the crystalline hydrate $3Cs_2CO_3,10H_2O$) begins to dissociate at 600°, and below 1000° its volatility is comparable with that of lithium carbonate.

If the alkali metals are arranged in the two sub-groups (1) lithium and sodium, (2) potassium, rubidium, and cæsium, it is seen that the readiness with which their carbonates dissociate decreases with the atomic weight in the first group and increases in the second.

M. A. W.

Composition of Bredig's Silver Hydrosols. J. C. Blake (*Amer. J. Sci.*, 1903, [iv], **16**, 431—432).—In preparing silver hydrosols according to Bredig's method, the author observed that the anode was eroded fully as much as the cathode, and the freshly prepared liquid was distinctly alkaline. The erosion of the anode under conditions described in the paper was measured.

Silver compounds are possibly formed during the preparation of silver hydrosols according to Bredig's method. A. McK.

Colloidal Silver. Allyre Chassevant (*Bull. Soc. chim.*, 1904, [iii], 31, 6—11).—The author disputes the idea advanced by Hanriot (Abstr., 1903, ii, 368) that collargol is an acid (collargollic acid). S. S.

Preparation and Properties of Pure Colloidal Silver. Allyre Chassevant (*Bull. Soc. chim.*, 1904, [iii], 31, 11—13).—Using Schneider's method (Abstr., 1892, 775), an alcoholic solution of colloidal silver was prepared, and was found to have the properties already ascribed to it by various authors. S. S.

Behaviour of Manganous Salts towards Silver Peroxide. Otto Kühling (*Zeit. angew. Chem.*, 1903, **16**, 1145—1150).—The action of silver peroxide nitrate, $2Ag_3O_4,AgNO_3$, prepared by the electrolysis of silver nitrate, on ammonium manganese sulphate, $MnSO_4,(NH_4)_2SO_4,6H_2O$, has been examined. The oxidation of manganous solutions by silver peroxide and nitric acid is slow in the cold. The solutions are at first coloured owing to the formation of permanganate; they gradually become colourless and manganese dioxide separates. On the continued addition of silver peroxide, the pink colour of the solution does not disappear until the solution is heated, and finally the colour is persistent, a clear solution of permanganic acid being formed.

The separation of the manganese as dioxide is in certain cases quantitative.

The permanganic acid, formed under conditions where no separation of manganese dioxide took place, was estimated by aid of hydrogen peroxide. A. McK.

Complex Metallic Compounds. Guido Bodländer (*Ber.*, 1903, **36**, 3933—3945. Compare Abstr., 1902, ii, 63; Bodländer and Fittig, *ibid.*, 248; Bodländer and Storbeck, *ibid.*, 502 and 607; Sherrill, Abstr., 1903, ii, 534 and 649; Bonsdorff, *ibid.*, 598; Euler, *ibid.*, 717).—A discussion of experimental results which are to be published in detail elsewhere. Tables I and II give the constants governing the stability of complex metallic salts in solution as determined by methods which have already been described (*loc. cit.*).

TABLE I.

Formula of the complex ion.	Concentration limits of the free anions.	Stability constant.	Heat of formation of 1 gram-equiv. from the simple ions in Cal.
$Ag(S_2O_3)_2'''$	below 0·1 *N*	$0\cdot98 \,.\, 10^{13}$	$17200 + 1340 \log[Ag][S_2O_3]^2/D$
$Ag(S_2O_3)_3^{v}$	above 0·5 *N*	$3\cdot45 \,.\, 10^{13}$	$18000 + 1340 \log[Ag][S_2O_3]^3/D$
$Ag(CN)_2'$	under 0·05 *N*	$0\cdot11 \,.\, 10^{22}$	$27900 + 1340 \log[Ag][CN]^2/D$
Ag_2I_4'' to AgI_4'''	indefinite limits	$7\cdot7 \,.\, 10^{13}$	$18460 + 1340 \log[Ag][I]^4/D$
$Ag(CNS)_2'$	below 0·2 *N*	$6 \,.\, 10^{9}$	$13000 + 1340 \log[Ag][CNS]^2/D$
$Ag(CNS)_4'''$	above 0·3 *N*	$1\cdot5 \,.\, 10^{11}$	$14850 + 1340 \log[Ag][CNS]^4/D$
$Hg(CN)_4''$	in all concentrations	$5\cdot05 \,.\, 10^{20}$	$27500 + 670 \log[Hg][CN]^4/D$
$Au(CN)_2'$	,, ,,	$> 2\cdot5 \,.\, 10^{29}$	$> 39000 + 1340 \log[Au][CN]^2/D$
$Cu(CN)_3''$ $Cu(CN)_4'''$	indefinite limits	$5\cdot6 \,.\, 10^{26}$	$35500 + 1340 \log[Cu][CN]^{3\cdot5}/D$
$Zn(CN)_3'$ $Zn(CN)_4''$	,, ,,	$5\cdot7 \,.\, 10^{8}$	$11600 + 670 \log[Zn][CN]^3/D$
$HZnO_2'$	in all concentrations	$1\cdot9 \,.\, 10^{6}$	$8340 + 670 \log[Zn][OH]^3/D$
$Zn(C_2O_4)_2''$	below 0·1 *N*	$1\cdot9 \,.\, 10^{3}$	$4360 + 670 \log[Zn][C_2O_4]^2/D$
$Zn(C_2O_4)_3''''$	above 0·1 *N*	$1\cdot8 \,.\, 10^{4}$	$5650 + 670 \log[Zn][C_2O_4]^3/D$

The logarithms are to base 10, and D denotes the concentration of the complex ion in gram-mols., not equivalents.

TABLE II.

Formula.	Tension of the solution for the metal with reference to the H-electrode.	Heat of formation in Cal. of 1 gram-ion of the complex from the metal and the anions.
$Ag(S_2O_3)_2'''$	$-0\cdot022 — 0\cdot058 \log D : [S_2O_3]^2$	$-512 — 1340 \log D : [S_2O_3]^2$
$Ag(S_2O_3)_3^{v}$	$+0\cdot009 — 0\cdot058 \log D : [S_2O_3]^3$	$+209 — 1340 \log D : [S_2O_3]^3$
$Ag(CN)_2'$	$+0\cdot444 — 0\cdot058 \log D : [CN]^2$	$+10330 — 1340 \log D : [CN]^2$
$Ag(CN)_3''$	$+0\cdot497 — 0\cdot058 \log D : [CN]^3$	$+11560 — 1340 \log D : [CN]^3$
Ag_2I_4'' to AgI_4'''	$+0\cdot054 — 0\cdot058 \log D : [I]^4$	$+1250 — 1340 \log D : [I]^4$
$Ag(CNS)_2'$	$-0\cdot197 — 0\cdot058 \log D : [CNS]^2$	$-4600 — 1340 \log D : [CNS]^2$
$Ag(CNS)_4'''$	$-0\cdot116 — 0\cdot058 \log D : [CNS]^4$	$-2700 — 1340 \log D : [CNS]^4$
$Hg(CN)_4''$	$+0\cdot384 — 0\cdot029 \log D : [CN]^4$	$+17860 — 1340 \log D : [CN]^4$
$Au(CN)_2'$	$+0\cdot611 — 0\cdot058 \log D : [CN]^2$	$+14210 — 1340 \log D : [CN]^2$
$Cu(CN)_3''$ and $Cu(CN)_4'''$	$+1\cdot098 — 0\cdot058 \log D : [CN]^{3\cdot5}$	$+25550 — 1340 \log D : [CN]^{3\cdot5}$
$Zn(CN)_3'$ and $Zn(CN)_4''$	$+1\cdot287 — 0\cdot029 \log D : [CN]^3$	$+59900 — 1340 \log D : [CN]^3$
$HZnO_2'$	$+1\cdot130 — 0\cdot029 \log D : [OH]^3$	$+52600 — 1340 \log D : [OH]^3$
$Zn(C_2O_4)_2''$	$+0\cdot988 — 0\cdot029 \log D : [C_2O_4]^2$	$+46000 — 1340 \log D : [C_2O_4]^2$
$Zn(C_2O_4)_3''''$	$+1\cdot017 — 0\cdot029 \log D : [C_2O_4]^3$	$+47300 — 1340 \log D : [C_2O_4]^3$

For a detailed discussion of these numbers, the original should be consulted.
W. A. D.

New Method of preparing some Anhydrous Crystalline Fluorides. EDOUARD DEFACQZ (*Compt. rend.*, 1903, **137**, 1251—1253. Compare Poulenc, Abstr., 1894, ii, 234).—When a mixture of ten parts of calcium chloride and one part of manganous fluoride (compare

Moissan and Venturi, Abstr., 1900, ii, 405) is fused in an atmosphere of carbon dioxide at 1000—1200°, double decomposition occurs, and after treating the fused mass with water to remove the manganous chloride and unchanged calcium chloride, and with dilute hydrochloric acid to remove oxidation products, the calcium fluoride is obtained in the form of crystals, the shape of which vary with the temperature of the fusion, being octahedra when the fusion has been effected at 800—1000°, and perfect cubes when the temperature of the fusion has been 1200—1400°. The reaction between manganous fluoride and calcium chloride is partly reversible, calcium fluoride reacting with manganous chloride to yield calcium fluorochloride; for this reason, it is necessary to have a large excess of calcium chloride in preparing crystalline calcium fluoride by this method. M. A. W.

Preparation of Barium Nitrite. Otto N. Witt and Kurt Ludwig (*Ber.*, 1903, **36**, 4384—4389. Compare Matuschek, *Chem. Ind.*, 1902, **25**, 207).—Equivalent quantities of dry sodium nitrite and barium chloride are intimately mixed and added to sodium nitrite (1 equivalent) dissolved in 3 times its weight of boiling water. By using an excess of sodium nitrite, the "salting out" of part of the barium chloride before the reaction is complete is prevented. The precipitated sodium chloride is immediately removed by a hot filter, and on cooling the filtrate, well-defined crystals of barium nitrite, $Ba(NO_2)_2,H_2O$, are obtained. They are best removed by the aid of a good centrifuge. The mother liquor, which contains the excess of sodium nitrite, may be used again. When heated, it begins to evolve oxides of nitrogen at 115°. J. J. S.

The Non-precipitability of Magnesium by Ammonia in the presence of Ammonium Salts. Frederick P. Treadwell (*Zeit. anorg. Chem.*, 1903, **37**, 326—331).—A series of physico-chemical experiments which confirm Loven's statement (Abstr., 1896, ii, 413) that the non-precipitation of magnesium (and similar elements) by ammonia in the presence of ammonium salts is not due to the formation of a complex salt, but solely to the retardation of the dissociation of the ammonium hydroxide by the ammonium chloride according to the law of mass action. L. de K.

Formation of Red Lead by Light and Air. Georg Kassner (*Arch. Pharm.*, 1903, **241**, 696—708).—A specimen of lead monoxide (massicot) was exposed to direct sunlight during eight years in a bottle which was shaken and opened frequently; it had then turned red, and was found to contain available oxygen. Of the red powder, 43·1 per cent. could be extracted with a concentrated solution of lead acetate; the amount of available oxygen in it corresponded with a percentage of $18·8PbO_2$ in the residue, which therefore must have had a composition lying between Pb_5O_6 and Pb_6O_7. A product containing available oxygen was also obtained when well dried massicot was exposed to sunlight in a sealed glass tube; the residual air contained only 11·2 per cent. of oxygen. Evidently moisture is not concerned in the oxidation.

It is suggested that the oxidation consisted in the addition of atomic oxygen, resulting from ionisation of the gas under the influence of the light in immediate contact with the coloured substance. In support of this view, an experiment is described in which massicot was converted into a brown substance containing available oxygen by passing ozonised oxygen over it. It is thought that the suggested explanation may apply to other cases of autoxidation. C. F. B.

Decomposition of Mercurous Chloride by Solutions of Alkali Chlorides. JUL. GEWECKE (*Zeit. physikal. Chem.*, 1903, **45**, 684—696. Compare Richards and Archibald, Abstr., 1902, ii, 384; Sherrill, Abstr., 1903, ii, 534).—When mercurous chloride is shaken with concentrated solutions of sodium, potassium, or ammonium chloride (at 25°, 35°, and 45°), mercuric chloride and mercury are formed, the extent of the action increasing with the temperature and the concentration of the alkali chloride. The mercuric chloride probably exists as a double salt (compare Le Blanc and Noyes, Abstr., 1890, 388), and it is supposed that this double salt is practically undissociated in presence of the great excess of alkali chloride, and that the action (with sodium chloride) may be represented by the equation: $Na^{\cdot} + Na^{\cdot} + Cl' + Cl' + Hg_2Cl_2 = Na_2HgCl_4 + Hg$. The mass action law then requires $c_1/c^4 = K$, where c_1 is the concentration of the double salt, and c that of the chlorine ions. The values of K obtained in this way tend to diminish as the concentration of the alkali chloride increases.

It is shown that mercury dissolves slightly when shaken with an alkali chloride in presence of air, and this must be allowed for in considering the action of alkali chloride on mercurous chloride.

In spite of the above observations, the use of calomel electrodes in concentration cells is permissible, provided the alkali chloride solutions are dilute. It is further advisable to use air-free solutions, and to keep the temperature down. J. C. P.

Preparation of Cerium Dioxide and its Reduction in a Current of Hydrogen. RICHARD JOSEPH MEYER (*Zeit. anorg. Chem.*, 1903, **37**, 378—393).—For the preparation of pure cerium dioxide, the author uses the commercial mixture of oxalates from monazite sand, from which the thorium has been extracted; in some cases, Swedish cerite is employed. The material is first converted into the crystallised ammonium double nitrate, the solution of which, after having first been treated with hydrogen sulphide, is warmed at 60—70° with pure hydrogen peroxide, whereby the thorium and cerium peroxide are quantitatively removed. The dissolved cerium is then precipitated by magnesium acetate and hydrogen peroxide, and the basic acetate so obtained converted into cerium ammonium nitrate, which is repeatedly crystallised from nitric acid. The oxalate is next prepared and converted into the oxide, from which the sulphate is obtained. In order to free the latter from the trace of lanthanum it contains, it is acted on by potassium permanganate and sodium carbonate, and acidified by nitric acid. The residue is treated with a mixture of hydrochloric and oxalic acids, whereby cerium oxalate is obtained, which, on being heated to redness, yields an oxide completely free from lanthanum. The slight coloration exhibited by the oxide after this treatment is completely removed by treating the solution with sulphurous and hydrochloric acids.

Pure cerium dioxide is faintly yellow. The colour becomes more intense when the dioxide is heated; this is probably due to polymerisation, but not to reduction.

The reduction of cerium dioxide by hydrogen takes place only in the complete absence of air. With increasing temperature, the colour of the oxide changes to greenish and then to a bluish-black tint. The constitution of the blue oxide obtained has not yet been determined. The quantitative determinations quoted show that the sesquioxide, Ce_2O_3, is not formed by the reduction of cerium dioxide by hydrogen.

A. McK.

Series of Artificial Quadratic Spinels of the Hausmannite Type. I and II. Alexandre Gorgeu (*Bull. Soc. chim.*, 1903, [iii], 29, 1111—1117; 1167—1174).—The author has previously assigned to manganate and hausmannite the formulæ, MnO_2,MnO,H_2O, and $MnO_2,2MnO$ respectively, since these minerals were partially soluble in nitric acid, leaving a residue of manganese dioxide. He now finds that when hausmannite is treated with dilute acetic acid, 2/3 of the manganese is obtained as a residue of manganese sesquioxide, the remainder passing into solution as manganese acetate, whilst manganite is unchanged by this treatment, indicating that hausmannite should be represented by the formula Mn_2O_3,MnO and manganite by Mn_2O_3,H_2O.

When manganous, sodium, and zinc sulphates are fused together and the resulting product is washed with water and dilute acetic acid, there is obtained a crystalline residue having the composition Mn_2O_3,ZnO, and crystallographic and optical properties similar to those of hausmannite. Similar compounds have been prepared in which the manganous oxide of hausmannite is partially replaced by magnesium or cadmium oxides, but no definite products containing nickelous or cobaltous oxide could be isolated owing to the insolubility of the by-products obtained in these two cases in dilute acetic acid.

Products of this character may also be prepared by ignition of the metallic manganites formed by the digestion of freshly precipitated hydrated manganese dioxide in aqueous solutions of neutral salts.

The manganites of magnesium, $MgO,4MnO_2$, zinc, $ZnO,3MnO_2$, cadmium, $CdO,5MnO_2$, and nickel, $NiO,5MnO_2$, thus prepared, furnished on ignition, products containing respectively 7·54, 7·01, 6·35, and 7·22 per cent. of "active" oxygen, that is, oxygen not present in the form of metallic protoxides, whereas if the products had consisted merely of admixtures of Mn_3O_4 with the oxides of the various metals, only 6·09, 5·42, 5·29, and 5·92 per cent. respectively of "active" oxygen would have been found. Whence the author concludes that a mixed oxide of the type Mn_2O_3,MO was formed in each of these cases and also by the ignition of copper manganite, $CuO,4MnO_2$, and cobalt manganite, $CoO,6MnO_2$, similarly prepared. No mixed oxides were obtained by igniting manganites of potassium or barium.

When freshly precipitated hydrated manganese dioxide is digested in a hot aqueous solution of cobalt sulphate, part of the manganese is dissolved, and the insoluble product obtained consists of cobalt mangano-cobaltite, which on ignition at a red heat furnishes a product which is not a mixture of the oxides Mn_3O_4 and Co_3O_4, since the latter is unstable at a red heat; the author regards it as a complex oxide of the formula $Mn_2O_3Co_2O_3,MnOCoO$. The ignition of a ferric manganite, $Fe_2O_3,12MnO_2$, gave a product containing Fe_2O_3,MnO.

These results indicate that oxides of the hausmannite type may be obtained in which manganese may be partially replaced by other metals both in the acidic (sesquioxide) and basic (protoxide) portions of the molecule; the metals capable of so replacing the manganese are those which occur in the natural spinels of the regular system.

T. A. H.

Electrolytic Preparation of Metallic Permanganates. CHEMISCHE FABRIK GRIESHEIM-ELEKTRON (D.R.-P 145368).—The metallic permanganates, which are not readily obtained from potassium permanganate by double decomposition, may be prepared electrolytically. A closed electrolytic cell, with suitable diaphragm and provided with tubes for the escape of gases, is employed. In the preparation of calcium permanganate, for instance, the cathode cell contains a dilute solution of potassium hydroxide. The anode cell contains potassium permanganate solution, kept saturated by suspended baskets of the salt. During the electrolysis, lime is added to this cell from time to time in the form of a cream. Hydrogen is evolved at the cathode and oxygen at the anode, the permanganic acid formed combining with the lime. After a time, the calcium and potassium permanganates remaining are separated by crystallisation. Calcium chloride may be used in place of lime, in which case the cathode cell is filled with a saturated solution of potassium chloride.

C. H. D.

New Method of Determining the Critical Points of Iron and Steel. OCTAVE BOUDOUARD (*Compt. rend.*, 1903, **137**, 1054—1056).—A preliminary note describing the modification of Saladin's apparatus employed in the determination of the critical points of iron and its alloys. No results are given. M. A. W.

Influence of Pressure on the Transition Temperatures of Iron. GUSTAV TAMMANN (*Zeit. anorg. Chem.*, 1903, **37**, 448—454).—At 770°, α-iron passes into the β-form, which at 890° is transformed with contraction into the γ-form. These transformations are reversible, and the influence of pressure on the transition temperature may be calculated by aid of the Clausius-Clapeyron formula, $dT/dp = \Delta vT/Rp$. In the transformation of the α- into the β-form, the value $dT/dp = 0$, that is, the temperature of the transformation is independent of the pressure. At 770° under a pressure of 12,000 kilo. per sq. cm., the transition curves of the α- into the β-form and of the β- into γ-forms cut one another at a triple point, where α-, β-, and γ-iron are in equilibrium.

With 0·3 per cent. of carbon, the same transition of γ- into a-iron can be effected as under a pressure of 12,000 kilos. in the absence of carbon. A. McK.

Constitution and Properties of Silicon Steels. Léon Guillet (*Compt. rend.*, 1903, **137**, 1052—1054).—According to their micrographical properties, steels containing silicon may be divided into three groups: (1) steels containing 0—5 per cent. of silicon, in which all the carbon is in combination. (2) Steels containing 5—7 per cent. of silicon, in which the carbon is partly combined and partly in the form of graphite. (3) Steels containing more than 7 per cent. of silicon, in which all the carbon is in the form of graphite. The last group may be sub-divided into (*a*) steels formed by a solution of ferrosilicon, and containing bright crystals of the iron silicide, Fe_2Si, (*b*) steels containing well-formed crystals of the monosilicide, FeSi.

With regard to the mechanical properties of silicon steels, only those containing less than 5 per cent. of silicon have any technical value; these offer a greater resistance to shock after tempering than before, and on this account are particularly useful for the manufacture of springs. M. A. W.

Preparation of Ammonio-nickel Chloride and Separation of Nickel from other Metals. Hans Albert Frasch (D.R.-P. 146363).—The addition of an excess of ammonia to a solution of nickel chloride produces the known compound $Ni(NH_3)_2Cl_2,4NH_3$, which may be precipitated by sodium or potassium chloride as a violet-blue, very hygroscopic powder, and dried after washing with an ammoniacal solution of an alkali chloride. It separates from warm, slightly ammoniacal water in large, violet, double pyramids. Zinc, copper, &c., remain dissolved in the ammoniacal solution. Iron and manganese are preferably removed by means of calcium carbonate before the addition of ammonia. The same salt is obtained when sodium chloride is added to solutions of other nickel salts, such as the sulphate or chloride. C. H. D.

Hydrates of Molybdic Acid. II. Arthur Rosenheim and Isser Davidsohn (*Zeit. anorg. Chem.*, 1903, **37**, 314—325. Compare Rosenheim and Bertheim, Abstr., 1903, ii, 374).—Molybdic acid dihydrate, $MO_3,2H_2O$, is conveniently prepared as follows. To a 15 per cent. solution of commercial ammonium paramolybdate, a 20 per cent. solution of nitric acid is added with constant stirring. Ammonium nitrate is then added until the solution contains 10 per cent. of it, and the whole is then sown with a nucleus of molybdic acid dihydrate. After 8 days at 20—25°, an abundant crop of the dihydrate separates.

The solubility of the dihydrate is greatly increased by the addition of ammonium salts; the figures quoted indicate that the dihydrate is not a colloid. On the other hand, a colloidal acid appears to be formed when an aqueous solution of the dihydrate is concentrated under diminished pressure over sulphuric acid at 20°. A vitreous mass is thus obtained, which dissolves in water to an opalescent solution, which, with electrolytes, gives a precipitate of molybdic acid.

When a solution of molybdic acid dihydrate is concentrated at 40—50°, *a-molybdic acid monohydrate*, MO_3,H_2O, is formed as asbestos-like white needles. It differs from the monohydrate, described as being formed from the dihydrate at 70° (*loc. cit.*), in its more defined crystalline habitus and in the rapidity with which it settles from a suspension in water. Further, it retains its water of crystallisation much more readily than the form previously described (β-form).

The solubility in water of the α-monohydrate was determined at different temperatures. The solubility curves of the α-monohydrate and the dihydrate cut one another at 32°, whilst at 60°, the α-monohydrate appears to undergo transformation into the β-variety. The molecular conductivity of the α-monohydrate is almost identical with that of methyl molybdate, whilst the values for the dihydrate are much higher. Solutions of the α-monohydrate contain a molybdic acid of a smaller molecular weight than the acid in solutions of the dihydrate. The rate of hydrolysis of methyl acetate by solutions of methyl molybdate was also measured, from which it is concluded that the α-monohydrate is a much weaker acid than the dihydrate. The transformation of the various hydrates of molybdic acid into one another is accordingly regarded as involving the formation of intermediate polymerisation products.

Colloidal molybdic acid was obtained by evaporating a solution of the dihydrate at 20°, or, better, by warming a solution of sodium molybdate (1 mol.) and hydrochloric acid (4 mols.). The hydrosol so obtained is readily soluble and, from the solution, electrolytes precipitate the molybdic acid, but whether as hydrogel or hydrosol has not yet been determined. The solutions, previously prepared by other authors according to Graham's method, probably contained no colloidal acids, since electrolytes, when added to them, did not cause a precipitate. A. McK.

Tungsten Bronzes. Ewald Engels (*Zeit. anorg. Chem.*, 1903, **37**, 125—151).—The electrolytic preparation of various tungsten bronzes is described. Tungstic acid, prepared from the commercial sodium tungstate, is fused with the calculated amount of the metallic carbonate and the mass then electrolysed.

Sodium barium tungsten bronze, $2BaW_4O_{12},3Na_2W_5O_{15}$, prepared by a current of 4·5 amperes and 1·6 volts, forms dark blue crystals and, when immersed in water, shows a brilliant red lustre. The *bronze*, $BaW_4O_{12},5Na_2W_3O_9$, prepared from barium tungstate (1 mol.) and sodium tungstate (3 mols.), forms yellowish-red cubes. *Potassium barium tungsten bronze*, $BaW_4O_{12},5K_2W_4O_{12}$, forms dark red, quadratic pyramids. *Sodium strontium tungsten bronze*, $SrW_4O_{12},5Na_2W_5O_{15}$, forms brilliant violet, rhombic or quadratic pyramids. The *bronze*, $SrW_4O_{12},12Na_2W_3O_9$, crystallises in regular pyramids. *Potassium strontium tungsten bronze*, $SrW_4O_{12},5K_2W_4O_{12}$, forms red, rhombic or quadratic pyramids. *Sodium calcium tungsten bronze*,

$$CaW_4O_{12},5Na_2W_5O_{15},$$

forms violet, rhombic or quadratic pyramids. The *bronze*,

$CaW_4O_{12},10Na_2W_3O_9$, forms purple cubes or pyramids. *Potassium calcium tungsten bronze*, $CaW_4O_{12},5K_2W_4O_{12}$, forms glistening, red pyramids. A. McK.

Uranyl Double Nitrates. Richard Jos. Meyer and Fritz Wendel (*Ber.*, 1903, 36, 4055—4058).—The properties of the double nitrates studied by Meyer (Abstr., 1900, ii, 597; 1901, ii, 510; 1903, ii, 211) rendered it probable that similar compounds would be formed by other metals of high atomic weight.

The double nitrates of uranyl with potassium, ammonium, rubidium, cæsium, and thallium crystallise well from nitric acid, and with the exception of the thallium salt, exhibit strong fluorescence. They are decomposed into their components by water, the thallium salt even by moist air. The composition is in all cases represented by the formula $R'UO_2(NO_3)_3$. Attempts to prepare similar salts of sodium and lithium, or of bivalent metals, failed. C. H. D.

Action of Titanic Anhydride on Sodium Carbonate. D. P. Smith (*Zeit. anorg. Chem.*, 1903, 37, 332—336).—When molecular quantities of sodium carbonate and titanium dioxide are fused together, a homogeneous mass is formed, which gradually loses carbon dioxide on exposure to the atmosphere. In the melted mass, the equilibrium is represented by $Na_2CO_3 + TiO_2 \rightleftharpoons Na_2TiO_3 + CO_2$, and the amount of carbon dioxide in the mass must be very small, since on cooling no carbon dioxide is evolved. When the mixture is heated at 900—1100° in carbon dioxide under atmospheric pressure, the equilibrium is represented by $0{\cdot}29Na_2CO_3 + 0{\cdot}29TiO_2 \rightleftharpoons 0{\cdot}71NaTiO_3 + xCO_2$. This equilibrium has been experimentally studied by the author. The interaction between titanium dioxide and potassium carbonate, silica and sodium carbonate, zirconium dioxide and sodium carbonate respectively has also been examined. A. McK.

Bismuth Oxide. W. Guertler (*Zeit. anorg. Chem.*, 1903, 37, 222—224).—When melted bismuth oxide was allowed to cool, the mass was observed to glow after crystallisation had begun. The curve of cooling was followed when it was found that during the crystallisation the temperature remained constant at 820° (±2°); it then fell to 680° (±2°), and then rose to 704° (±4°) and finally fell quickly. The transition temperature of the one modification into the other accordingly lies at 704°, a result which was confirmed by the curve of heating. The first modification could not be obtained at the ordinary temperature. A third modification was obtained by heating bismuth oxide in a porcelain crucible; it melts at a higher temperature than the second variety and is more stable; it dissolves in dilute nitric or sulphuric acids less readily than does the second variety. A. McK.

Behaviour of Red Colloidal Gold Solutions towards the Electric Current and towards Electrolytes. J. C. Blake (*Amer. J. Sci.*, 1903, [iv], 16, 433—441).—Colloidal gold solution was electrolysed in a U-tube with 0·005 ampere, each electrode just entering the liquid; the gold, after 12 hours, becomes concentrated in a red cloud at the bend of the tube, except for a slight deposit of dark-coloured slime on the anode.

The effect of the addition of various salts in transforming red colloidal gold solutions into blue colloidal gold solutions and in causing subsequent sedimentation has been examined. The stability of red colloidal gold solutions is partly due to the ether present. The influence of various electrolytes on the transformation of red colloidal gold solutions during the passage of the electric current is also described. A. McK.

Behaviour of Platinum Amalgams with Nitric Acid. Nazareno Tarugi (*Gazzetta*, 1903, **33**, [ii], 171—186).—The method proposed by Knoevenagel and Ebber (Abstr., 1902, ii, 697) for the separation of the metals of the second group, is not only less simple than methods previously in use but contains fresh sources of error. In particular, the proposed separation of bismuth, platinum, and gold is by no means complete, whilst arsenates become reduced to arsenites, which hinder the reduction of gold and platinum salts by the hydrazine. Further, in a mixture of finely-divided metals, such as is obtained by reduction from solutions of their salts, the individual metals do not retain the distinctive chemical properties which they possess in the free, unmixed condition. Especially is this so when mercury is present, as then amalgams are formed, the properties of which render inapplicable the ordinary method of separating the metals by means of acids. Thus, from a mixture containing 4·64 per cent. of platinum and 95·35 of mercury, nitric acid dissolves the whole of the platinum; as the percentage of platinum present increases, the proportion of the total amount dissolved by the acid diminishes, whilst the proportion of mercury dissolved decreases from 99 per cent. in a mixture of 91·11 parts of mercury and 8·88 of platinum to zero for a mixture of 17·02 per cent. of mercury with 82·97 of platinum.

Microscopic examination confirms the fact that amalgams are formed during the simultaneous reduction of platinum and mercury from solutions of their salts.

With a mixture of gold and mercury salts in solution, however, reduction by hydrazine does not lead to the formation of amalgams. T. H. P.

Platinum Phosphorus Halogen Compounds and their Derivatives. I. Arthur Rosenheim and Willy Lowenstamm (*Zeit. anorg. Chem.*, 1903, **37**, 394—406).—Trichlorophosphorusplatochloride, prepared by the action of phosphorus pentachloride on platinum at 250°, may be represented as $PCl_3,PtCl_2$ or $Pt(PCl_3)Cl_2$, whilst ditrichlorophosphorusplatochloride is $(PCl_3)_2,PtCl_2$ or $Pt(PCl_3)_2Cl_2$. The research was undertaken to decide whether those compounds are analogous to the platosamines of Werner, of which the compound $Pt(NH_3)_2Cl_2$ may be taken as a type. Molecular weight determinations with the two chlorides under consideration led to no result, since the substances decomposed in boiling solvents and were too insoluble in cold solvents to permit of cryoscopic observations being made with them. Successful determinations could, however, be made with the ethers, which are easily obtainable from the chlorides.

Ethyl phosphite platochloride, $P(OEt)_3,PtCl_2$, forms dark yellow prisms. *Dimethyl phosphite platochloride*, $[P(OMe)_3]_2,PtCl_2$, crystallises in prismatic needles. The analogy with Werner's platosamines is shown, and evidence is also submitted to indicate that phosphorus in these compounds is tervalent. By the action of halogen on compounds of tervalent phosphorus and bivalent platinum, compounds are obtained which contain quadrivalent platinum and quinquevalent phosphorus. When chlorine is passed into a benzene solution of ethyl phosphite platochloride, reddish-yellow crystals of *triethyl phosphate platinic chloride*, $PtCl_4,PO(OEt)_3$, separate. *Triethyl phosphate platinic dibromochloride*, $PtCl_2Br_2,PO(OEt)_3$, prepared by the action of dry bromine on a benzene solution of ethyl phosphite platochloride, separates in purple, deliquescent prisms.

Platinic chloride, prepared by heating chloroplatinic acid in a current of chlorine at 275°, acts only on the esters of quinquevalent phosphorus and not on those of tervalent phosphorus; with ethyl phosphate, it interacts to form triethyl phosphate platinichloride, whilst it does not act on ethyl phosphite. Platinous chloride, on the other hand, reacts with esters of phosphorous acid, but not with esters of phosphoric acid. A. McK.

Action of a Mixture of Oxygen and Hydrochloric Acid on some Metals. CAMILLE MATIGNON (*Compt. rend.*, 1903, **137**, 1051—1052. Compare Abstr., 1902, ii, 556).—In addition to gold, platinum, and tellurium, the author finds that all the metals of the platinum series are chlorinated by a mixture of air and hydrochloric acid. Palladium is attacked in the cold, 2·6 grams of the metal lost 0·23 gram in several weeks, and from the solution the chloride $PdCl_2$ was isolated. Spongy ruthenium is very slowly attacked at the ordinary temperature, but in a sealed tube at 125° the chlorination is complete in a few hours, crystals of chlororuthenic acid being formed. Iridium, free from iron, is not attacked in the cold, but after heating at 150° with hydrochloric acid in a sealed tube containing oxygen for 6—8 hours, the solution reacts with the chlorides of ammonium, potassium, or cæsium to give the corresponding coloured iridiochlorides. Rhodium turnings are not attacked in the cold, but at 150° there is a slow reaction, the solution assuming the rose-colour characteristic of rhodium salts, whilst at 200° the solution is more rapid, as much as one gram of rhodium being dissolved in one experiment. Spongy osmium passes slowly into solution at 150°, the solution assuming the yellowish-green colour characteristic of osmium salts.

M. A. W.

Iridium Sesquiselenide. CAMILLE CHABRIÉ and A. BOUCHONNET (*Compt. rend.*, 1903, **137**, 1059—1061).—Iridium sesquiselenide, Ir_2Se_3, precipitated by hydrogen selenide from a hot solution of iridium sesquichloride, is a non-crystalline, shining black powder, not attacked by ordinary nitric acid, even on warming, slightly decomposed by fuming nitric acid in sealed tubes at 250°, and slowly dissolved by aqua regia. When iridium and selenium are heated to redness in sealed tubes for several hours, a black, confusedly crystalline mass is obtained, which differs from the preceding compound by the greater resistance it offers to the action of reagents; it is not attacked by aqua regia, bromine water, or a mixture of alkali nitrates and chlorates, and it can be fused with lead fluoride without undergoing decomposition. M. A. W.

Mineralogical Chemistry.

Sartorite from the Binnenthal, Switzerland. William J. Lewis (*Min. Mag.*, 1903, **13**, *Proc.* xxxiv).—A large isolated crystal, measuring 4 × 1 × $\frac{1}{3}$ inch, of a sulpharsenite of lead proved, on analysis by H. Jackson, to be sartorite. The results obtained were: Pb, 42·93; As, 31·11; S, 25·32. L. J. S.

Swedish Hausmannites. Alexandre Gorgeu (*Bull. Soc. chim.*, 1903, [iii], **29**, 1109—1111. Compare Abstr., 1894, 19, 99).—Three specimens of Swedish hausmannite were found to contain small quantities of the bivalent metals, zinc, magnesium, calcium, and barium. These constituents are regarded not as mechanical impurities, but as existing in combination with the manganese sesquioxide, and partially replacing manganous oxide in the mineral (compare this vol., ii, 126). T. A. H.

Turgite-ores in Russia. J. Samojloff (*Zeit. prakt. Geol.*, 1903, **11**, 301—302. Compare Abstr., 1901, ii, 605).—Turgite (=turjite), which is to be regarded as a definite mineral species ($2Fe_2O_3,H_2O$), is of some importance in Russia as an ore of iron; its occurrence is noted at several localities in the Northern (river Turja, &c.) and Southern Urals, and in Central Russia. Analysis of material from Wladimirowka, gov. Tula, gave:

Fe_2O_3.	SiO_2.	Al_2O_3.	P_2O_5.	H_2O.	Total.
87·93	2·12	1·60	1·57	6·52	99·74

L. J. S.

Refractive Indices of Pyromorphite, Mimetite, and Vanadinite. Herbert L. Bowman (*Min. Mag.*, 1903, **13**, 324—329).—Detailed determinations of the refractive indices for light of three colours are given of the minerals of this group. The substitution of arsenic for phosphorus and of vanadium for arsenic in each case causes an increase in the refractive indices. The following values obtained for red (C) light may be quoted:

	ϵ.	ω.
I. Pyromorphite (Braubach, Nassau)	2·042	2·0504
II. Mimetite (Wheal Alfred, Cornwall ?) ...	2·1178	2·1344
III. Mimetite (Tintic district, Utah)	2·1178	2·1326
IV. Endlichite (Hillsboro', New Mexico) ...	2·292	2·341
V. Vanadinite (Tucson, Arizona)	2·299	2·354

The pale green mimetite (II) from Cornwall (?) contained only a trace of phosphoric acid, and the white mimetite (III) from Utah contained none. The pale liver-coloured pyromorphite (I) from Nassau, gave, on analysis :

PbO.	P_2O_5.	As_2O_5.	Cl.	F.	Fe, Ba, Ca.	Total (less O for Cl).
81·12	16·51	nil	2·71	nil	traces	99·73

L. J. S.

Rösslerite and Wapplerite. AUGUST B. DE SCHULTEN (*Bull. Soc. franç. Min.*, 1903, **26**, 99—103).—Attempts to prepare wapplerite [$H(Ca,Mg)AsO_4,3\frac{1}{2}H_2O$] were without success, and resulted in the formation of crystals of rösslerite ($HMgAsO_4,7H_2O$; sp. gr. 1·943), or of rösslerite together with pharmacolite. The existence of wapplerite is therefore doubted ; it is suggested that the material analysed for wapplerite was a mixture of magnesium and calcium arsenates, whilst the crystallographic determinations were made on rösslerite.

L. J. S.

Wollastonite [and Garnet] from Mexico. HENRY F. COLLINS (*Min. Mag.*, 1903, **13**, 356—362).—A description is given of a large boss of coarsely crystallised wollastonite, of presumably igneous origin, in which are the workings of the Santa Fé mine, State of Chiapas. Near the outskirts of the mass, the wollastonite is found as large crystals, frequently altered to opal, and is much intermixed with garnet, opal, bornite, siegenite (Abstr., 1902, ii, 460), enargite, &c. The rhombic dodecahedra of garnet vary in colour from olive-green to resin-yellow and reddish-brown ; analysis of green crystals gave I, of brown, II, and of both green and brown, III.

	SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.	Total.	Sp. gr.
I.	36·10	—	19·30	—	—	—	—
II.	36·48	—	19·50	—	—	—	—
III.	36·35	12·37	19·43	33·33	0·40	101·88	3·89

L. J. S.

Composition of Glauconite and Greenalite. FRANK W. CLARKE (*Monogr. U.S. Geol. Survey*, 1903, **43**, 243—247).—From Glinka's analyses (Abstr., 1899, ii, 112), the formula of ideally pure glauconite is deduced as $KFe'''Si_2O_6,H_2O$. Analyses by G. Steiger of the portions soluble in hydrochloric acid of the greenalite-rocks of Minnesota are given under I—III ; the insoluble portion consists mainly of quartz. The second of these approximates to the simple formula $Fe_2'''(Fe'',Mg)_3(SiO_4)_3,3H_2O$; the first also gives an orthosilicate ratio, but the third approximates to a metasilicate.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	H_2O.	CO_2.	Total.
I.	13·45	0·37	15·00	10·28	2·33	0·28	4·17	2·04	47·92
II.	19·30	0·61	13·83	17·57	3·22	—	5·74	—	60·27
III.	33·11	0·56	6·44	30·93	5·35	—	6·13	—	82·52

CHARLES K. LEITH (*ibid.*, 1—316) gives the name *greenalite* to green granules with the above composition, which occur abundantly as a constituent of the sedimentary rocks in the Mesabi iron-bearing district of Minnesota. The mineral closely resembles glauconite in appearance, but differs from it in containing no potassium. By the alteration of the greenalite, ferruginous cherts are formed, as well as immense deposits of iron ore. L. J. S.

Bakerite (a New Borosilicate of Calcium) and Howlite from California. WILLIAM B. GILES (*Min. Mag.*, 1903, **13**, 353—355).—Bakerite occurs as veins and nodules of considerable size in the mines of the Borax Consolidated Company in San Bernardino Co., California. In appearance, the white, amorphous masses resemble unglazed porcelain, fine white marble, or pandermite; sometimes the mineral has a faint sea-green tint. H. 4½; sp. gr. 2·73. The mineral is readily soluble in warm dilute hydrochloric acid. The following analyses of I, white material, and II, of material with a green tinge, give the formula $8CaO,5B_2O_3,6SiO_2,6H_2O$, showing the mineral to be distinct from danburite, datolite, and howlite, the previously known borosilicates of calcium.

	B_2O_3.	CaO.	SiO_2.	H_2O.	Al_2O_3,Fe_2O_3.	Na_2O,MgO.	Total.
I.	27·74	34·88	28·45	8·30	0·63	—	100·00
II.	26·85	35·22	28·05	8·66	1·22	—	100·00
III.	44·38	28·45	15·50	11·58	—	0·09	100·00
IV.	43·78	28·44	15·33	11·39	—	1·06	100·00

Howlite, colemanite, natroborocalcite, and pandermite also occur at the same locality. The howlite ($4CaO,5B_2O_3,2SiO_2,5H_2O$) occurs in large amount; soft, scaly, white material gave analysis III, and hard, rock-like, white masses gave the results under IV. L. J. S.

Volcanic Ash from Mont Pelée, Martinique. ARTHUR B. GRIFFITHS (*Bull. Soc. chim.*, 1903, iii, **29**, 1117).—The ash was microcrystalline, had sp. gr. 2·7211 and contained 3·24 per cent. of magnetic matter. The material, dried at 120°, gave on analysis:

SiO_2.	Al_2O_3.	CaO.	Fe_2O_3.	FeO.	MnO.	MgO.
55·01	20·50	9·00	3·20	4·86	0·25	3·06

K_2O.	Na_2O.	TiO_2.	SO_3.	P_2O_5.	Cl.	Total.
0·65	2·01	0·68	0·42	0·20	0·16	100·00

Together with traces of copper, nickel, and lithium. T. A. H.

Meteoric Iron. FLORIS OSMOND and G. CARTAUD (*Compt. rend.*, 1903, **137**, 1057—1059. Compare Abstr., 1902, ii, 400).—Meteoric iron, whether it has passed through the liquid state or been formed by the reduction of the chlorides, consists of homogeneous solid solutions of γ-iron and β-nickel. The solution, on cooling, deposits kamacite when the proportion of nickel is below 13 per cent., tænite when the proportion of nickel is above 44 per cent., or a mixture of kamacite and tænite when the solution contains proportion of nickel intermediate between these two values. From a solution containing 30 per cent. of nickel, plessite, which may be regarded as the eutectic mixture of kamacite and tænite, is deposited. M. A. W.

Physiological Chemistry.

Quantity of Fat contained in Human Blood and Some Organs. Theodor Rumpf, H. Dennstedt, and A. Gronover (*Chem. Centr.*, 1903, ii, 1253—1254; from *Virchow's Archiv*, 174, 163—193).—The blood of two still-born children was found to contain 0·057 and 0·007 per cent. of fat respectively, and since these quantities could not have been affected by previous nutrition they were regarded as normal. In cases of severe diabetes (coma), a slight increase of the content of fat is only occasionally observed, although in six cases the blood contained 0·015—0·124 per cent. In cases of arteriosclerosis, the fat increased regularly by small quantities and amounted to 0·11—0·183 per cent., but with simultaneous alcoholism the percentages were only 0·05 and 0·032. The largest quantity of fat, 0·335 per cent., was found in a case of leucæmia; in phthisis and in cirrhosis of the kidneys, 0·02 and 0·012—0·037 per cent. were observed respectively.

The hearts of the still-born children contained 12·93 and 15·84 parts of fat per 100 parts of dry substance. The higher limit in normal cases of this kind reaches 16 per cent. and corresponds with a content of 1 gram of nitrogen to 1·2—1·3 of fat. In two cases of arteriosclerosis, the hearts contained 52·61 and 59·32 per cent. respectively, and a case of leucæmia gave a percentage of 57·8. In diabetes, the fat reached 25·3—40·54 with the exception of one case of 16·1 per cent.; in nephritis 40·2 per cent. Constant results were not obtained in cases of anæmia and carcinoma.

The peripheral muscular system contains, in a normal state, 15·7 per cent. of fat, but 45·49—47·6 was found in degenerated muscles (multiple neuritis), corresponding with 1 gram of nitrogen to 2·3 of fat.

The livers of the still-born children contained 13·32 and 17 per cent. of fat respectively. In cases of cirrhosis of the kidneys with fatty degeneration of the liver, alcoholism, and tuberculosis, 34·6, 47·0, and 56·6 per cent. of fat were found respectively. The first stages of alcoholism are attended by increase in the amount of fat contained in the liver, but as the process of degeneration proceeds the fat gradually decreases to the normal amount and less. The kidneys of the still-born children contained 19·2 and 22·82 per cent. of fat respectively. In cases of pernicious anæmia, congestion of the kidneys, and cirrhosis of the kidneys, the quantity of fat increased to 34·3, 32, and 28 per cent. respectively.

No general conclusions could be drawn from the results of determinations of the fat in the spleen.

The solid fatty acids isolated from human fat have a low refractive index, and hence contain not only palmitic and stearic acids, but probably also myristic or lauric acid. E. W. W.

Formation of Oxalic Acid in the Animal Organism. Adolfo Montuori (*Rend. Accad. Sci. Fis. Mat. Napoli*, 1903, [iii], 9, 202—207).—Wiener (Abstr., 1902, ii, 338) has shown that, especially in birds, feeding with (among other substances) glycerol and propionic, lactic, pyruvic, hydracrylic, tartronic, malonic, mesoxalic, or β-hydroxybutyric acid, combined with simultaneous hypodermic injection of urea, determines a considerable increase in the secretion of uric acid. This he explains by supposing that the 3-carbon atom chain contained in the molecule of each of these compounds is capable of combining with two ureic residues to form uric acid. Now the author has previously shown (*Rend. Accad. Sci. Fis. Mat. Napoli*, 1901) that the introduction of oxalic acid into the animal organism also brings about the production of uric acid, and the present investigations, made with malonic, tartronic, lactic, β-hydroxybutyric, and citric acids and glycerol, were carried out with the object of discovering whether the feeding of dogs with these substances caused the formation of oxalic acid in the organism. With malonic, tartronic, and citric acids, positive results were obtained. With lactic acid, oxalic acid sometimes appeared in the urine, but never in large quantities; with birds, this acid may act differently. With β-hydroxybutyric acid, the gastro-enteric disturbances produced by even small proportions of the acid rendered the results valueless. Glycerol gave negative results. On administering sodium citrate internally to a dog, and at the same time injecting urea solution, the secretion of uric acid was increased. T. H. P.

Poisoning by Barium Salts. Presence of Barium in the Urine and the Absorption and Elimination of the Metal. Luigi Santi (*Gazzetta*, 1903, 33, ii, 202—216).—Barium was detected in considerable quantities in the urine and blood of a dog which had been poisoned by barium chloride, although in both cases soluble sulphates were simultaneously present in these fluids. It is shown experimentally that barium sulphate is dissolved to a considerable extent by a solution of sodium hydrogen carbonate, and that on adding a small quantity of sodium sulphate to a solution of the latter containing a few drops of barium chloride solution, no precipitate is formed. On boiling, barium carbonate is precipitated, and then on adding an acid the carbonate is dissolved, but is almost immediately reprecipitated as sulphate.

Dissolved carbon dioxide can act in a similar manner in preventing the precipitation of barium in presence of soluble sulphates. It is suggested that the presence of barium in the blood and urine in cases of barium poisoning is due to the sodium hydrogen carbonate in the former and the carbon dioxide dissolved in the latter. The other salts normally contained in these liquids have no power to render barium sulphate soluble. W. A. D.

Chemistry of Vegetable Physiology and Agriculture.

Methane Fermentation and the Ferment by which it is Produced. PIERRE MAZÉ (*Compt. rend.*, 1903, 137, 887—889).—A ferment which produces marsh gas was obtained from dead leaves. When the ferment was destroyed by heating at 60°, it was found that the mixed culture contained butyric and acetic ferments, whilst in presence of the methane ferment no acetic or butyric acid was detected. The conclusion is drawn that the methane ferment is fed at the expense of the products furnished by the butyric ferments. In support of this view, it was found that the methane ferment liberates marsh gas in absence of carbohydrates. The gaseous product consisted of marsh gas (81) and carbon dioxide (19 per cent.); but in some cases as much as 90 per cent. of marsh gas was found.

The ferment is provisionally termed *pseudo-sarcine*.

Pure cultivations were made, but all attempts to obtain fermentation with them failed. N. H. J. M.

Fermentation of Citric Acid as a Cause of Disease in Currant Wine. W. SEIFERT (*Chem. Centr.*, 1903, ii, 1286; from *Zeit. landw. Vers. Wes. Oest.*, 6, 738—747).—Currant wine which has been fermented is occasionally attacked by a disease which results in rendering the wine acid, turbid, and of a paler shade of colour; its taste also becomes harsh. The precipitate formed in these cases was found not only to contain yeast, but also numerous bacteria in the form of small rods. Attempts to isolate a pure culture failed, but by means of the mud, malic acid was converted into lactic acid, and citric acid was fermented, forming carbon dioxide, acetic acid, and alcohol. The latter process probably accounts for the disease of the wine.

Grape wines also contain micro-organisms which are able to ferment citric acid, and hence it is unwise to add this acid to such wines.

E. W. W.

Uric Acid Bacterium. CELSO ULPIANI (*Gazzetta*, 1903, 33, ii, 93—98).—It has been previously shown that, under certain conditions, a solution of uric acid undergoes a definite form of fermentation, and the author has now isolated the organism to which this is due by taking the fresh excreta of fowls and allowing them to remain in water for several days. The bacillus is motile, and appears in coccus forms which resist decolorisation by Gram's method. A clear saturated aqueous solution of uric acid containing small quantities of mineral matter, when inoculated with the bacterium, becomes turbid after 24 hours and whitish after 3 days, and after 4 days no longer gives the slightest trace of murexide reaction. Destruction of the uric acid takes place between the temperature limits, 29—42°, the optimum being 37°. The products of the action are carbamide and carbon dioxide. T. H. P.

Chemical Equation of the Fermentation of Uric Acid. M. Cingolani (*Gazzetta*, 1903, **33**, [ii], 98—125. See preceding abstract).—The author has determined quantitatively the products formed in the decomposition of uric acid by the uric acid bacterium, and finds the reaction to be expressed by the equation: $C_5H_4O_3N_4 + 2H_2O + 3O = 2CO(NH_2)_2 + 3CO_2$. The methods employed, which are fully described, include a biological method of estimating carbamide by converting it into ammonium carbonate by means of the carbamide bacterium. T. H. P.

Decomposition of Yeast Nucleic Acid by Bacteria. II and III. Alfred Schittenhelm and F. Schröter (*Zeit. physiol. Chem.*, 1903, **40**, 62—69, 70—80. Compare Abstr., 1903, ii, 679; and Iwanoff, *ibid.*, ii, 678).—The following organisms have been employed: *Bacterium coli*, *Staphylococcus pyogenes albus*, and a bacterial mixture from fresh fæces, the nutrient medium being Uschinsky's solution with and without sodium aspartate and ammonium lactate. The different organisms behave somewhat differently, and even the same organism can give different results with different media. Certain species destroy the nucleic acid yielding purine bases, others even decompose these bases. They do not all decompose the acids at the same rate, and the rate with a single species appears to be proportional to the number of active organisms present.

The gases evolved in the decomposition of yeast nucleic acid by bacteria have been examined. The mixed gases were found to consist of carbon dioxide, oxygen, nitrogen, and, in one case, hydrogen and methane.

When glycerol is present, the percentage of carbon dioxide is much higher. J. J. S.

Denitrification in Soil. II. Gaspare Ampola and Celso Ulpiani (*Gazzetta*, 1903, **33**, [ii], 125—129. Compare Abstr., 1901, ii, 524).—The cultivation experiments previously described (*loc. cit.*) were continued during last season, and confirm the results formerly obtained. The conclusions arrived at are: (1) under ordinary conditions, calcium nitrate, the natural product of nitrification, is but slightly attacked by denitrifying bacteria. To avoid loss of nitrogen, fresh stable manure, rich in straw, should not be applied to the ground during the period of nitrification. (2) In order that sodium nitrate may be employed to the best advantage, it must be applied when the stable manure in the soil has reached its state of maximum maturation. T. H. P.

Influence of the Assimilable Nitrogen of the Soil on the Action of Nodule Bacteria. Friedrich Nobbe and L. Richter (*Landw. Versuchs-Stat.*, 1903, **59**, 167—174).—*Vicia villosa* was grown in pots containing 4·5 kilos. of sand and 0·6 kilo. of garden soil under the following conditions: (1) without nitrate; (2) with 0·5 gram, and (3) with 1 gram of nitrogen as nitrate per pot. In one set, the pots were inoculated with a pure cultivation of *Vicia* nodule bacteria, and there was a second set without inoculation. The results showed that whilst in both sets the nitrate increased the growth according to the amount applied, the effect of inoculation (as measured by deducting the production in the pots without inoculation from that of the corresponding inoculated pots) diminished under the influence of nitrates.

In another set of experiments, the same plants were grown in a mixture of sand (4·0 kilos.) and garden soil (2·5 kilos.). During the first period of growth (beginning of June to the middle of July), the inoculated plants were less advanced and more restricted in growth than those which were not inoculated. By September 2nd, the growth in the two sets was about equal, and by the end of September the inoculated plants showed considerably more growth and contained much more nitrogen than the others. N. H. J. M.

After Effect of the Inoculation of Papilionaceous Plants on other Plants. Friedrich Nobbe and L. Richter (*Landw. Versuchs.-Stat.*, 1903, **59**, 175—177).—The results of experiments with oats grown in the pots of sand mixed with soil previously used for *Vicia villosa* (preceding abstract) showed that a greater yield of oats was obtained in the pots inoculated for *Vicia* than in those which had not been inoculated. The greater yields are accounted for by the larger root residues of the inoculated plants. N. H. J. M.

Influence of External Media on the Mineral Constituents of Plants. Alexandre Hébert and Georges Truffaut (*Bull. Soc. chim.*, 1903, [iii], **29**, 1235—1239. Compare Abstr., 1902, ii, 346, 523; 1903, ii, 172, 233, 505, and 607).—Comparative tables of the mineral constituents of a number of different plants, grown with and without manures, are given, and attention is directed to the fact that the table shows that the application of manures in agriculture does not induce any change in the character of the mineral constituents of a plant, although it may affect the proportion in which particular constituents occur, and hence that merely the rate of plant assimilation, but not its nature, is influenced by manures.
T. A. H.

Influence of External Media on the Composition of the Organic Matter of Plants. Alexandre Hébert and Eugène Charabot (*Compt. rend.*, 1903, **137**, 799—801).—The amounts of carbon, hydrogen, and nitrogen were determined in the upper parts and in the roots of the peppermint plants grown under conditions previously described (Abstr., 1903, ii, 607). The percentage results were very similar, notwithstanding the diversity of the salts applied as manure. N. H. J. M.

What is the Compound contained in certain Plant Juices which is able to liberate Iodine from Potassium Iodide? Keijirō Asō (*Chem. Centr.*, 1903, ii, 1249; from *Beiheft. Bot. Centr.*, **15**, 208—214).—Kastle and Loewenhart's theory that the oxidising agents contained in plant juices are organic peroxides is not in accordance with the author's observations, and no decisive proof has been advanced that the liberation of iodine from potassium iodide is due to the presence of such peroxides. Ordinary oxydase does not liberate iodine from the iodide, and there does not appear to be any connection between the guaiacum and the iodine reactions. The liberation of iodine in the case of buds of *Sagittaria* has been found to be due to the presence of nitrites. Many plants contain certain benzene compounds which interfere with the Griess test for nitrites.

E. W. W.

Lecithins prepared from Plants. I. Ernst Schulze and Ernst Winterstein (*Zeit. physiol. Chem.*, 1903, **40**, 101—119).—Largely a *résumé* of previous work (compare Abstr., 1889, 645; 1891, 1541; 1893, ii, 185; 1894, ii, 155, 402; 1895, ii, 96). The lecithins have been obtained not merely by extraction with ether but also with alcohol at 50—55°. The crude lecithin contains a substance which is sparingly soluble in alcohol. This is not a pure compound, as the product obtained from different seeds varies in composition and the composition is largely altered by extraction with alcohol. The substance, on hydrolysis with baryta, yields choline, glycerophosphoric acid, and fatty acids.

The fate of lecithins in the germinating seed is also discussed (Schulze and Maxwell, 1891, 1541; also Iwanoff, *ibid.*, 1903, ii, 94; and Zaleski, *ibid.*, ii, 94).

J. J. S.

The Sap of Asclepias Syriaca. J. Marek (*J. pr. Chem.*, 1903, [ii], **68**, 449—463. Compare this vol., ii, 73).—On recrystallisation from a mixture of ether and alcohol, that part of the sap residue which is only slightly soluble in 95 per cent. alcohol yields an *acetate*, $C_{30}H_{49}{\cdot}OAc$, which crystallises in long, colourless prisms and melts at 239—240°. On hydrolysis with alcoholic potassium hydroxide, it yields potassium acetate and a *hydroxy*-compound, $C_{30}H_{50}O$, which crystallises in clusters of long, thin, colourless prisms and melts at 192—193°. It gives a yellow to carmine coloration with Liebermann's reagent, and when boiled with dilute nitric acid yields a yellow *product* which dissolves in alkalis to a yellow solution. With benzoic chloride in benzene solution, the hydroxy-compound forms a *benzoate*, $C_{30}H_{49}{\cdot}OBz$, which crystallises in colourless prisms, melts at 229—230°, and is soluble in benzene but only slightly so in alcohol or ether. The ether-alcoholic mother liquors from the purification of the acetate contain a *butyrate*, which separates as a yellow, transparent resin, melts at 71—75°, and on hydrolysis yields potassium butyrate, a small amount of potassium acetate, and a *hydroxy*-compound which loses weight on drying; the product, after 44 hours, melts at 87—90° and gives yellow, through red, to green colorations with Liebermann's reagent.

On treatment of the sap with water and repeated extraction of the insoluble part with alcohol, a white precipitate is obtained on cooling the alcoholic extract. This precipitate, on crystallisation from ether, yields two *substances*. The one, $C_{34}H_{56}O_3$ or $C_{35}H_{58}O_3$, is a yellow, amorphous, transparent substance and melts at 79—83°. The other substance crystallises from ether in white, cauliflower-like aggregates, melts at 215—216°, and on hydrolysis with alcoholic potassium hydroxide yields potassium butyrate and a *hydroxy*-derivative, $C_{28}H_{46}O$, which crystallises in glistening, delicate needles, melts at 180—181°, is insoluble in water, soluble in alcohol, and easily so in other organic solvents; with Liebermann's reagent, it gives an orange-red coloration, which fades after a time. When boiled with dilute nitric acid, it yields an orange-yellow *nitro-compound*. The *acetate*, $C_{28}H_{45}\cdot OAc$, resembles the butyrate in its crystalline form and melts at 201—202°; the *benzoate*, $C_{28}H_{45}\cdot OBz$, forms colourless, prismatic crystals, melts at 195—196°, and is hydrolysed with formation of the hydroxy-derivative melting at 180—181°. In one experiment, the hydroxy-compound obtained melted at 162—163°. G. Y.

Production and Distribution of some Organic Substances in Citrus Madurensis. Eugène Charabot and G. Laloue (*Compt. rend.*, 1903, **137**, 996—998. Compare Abstr., 1903, i, 47; ii, 568).—The stems of *Citrus madurensis* contained less water than the leaves during the early periods of growth. The acidity (volatile acids) is greater in the young plants than when the plants are more advanced; the actual amount of volatile acids, however, increases. Odoriferous compounds are formed most abundantly when the leaves are young, and are more abundant in the leaves than in the stems. Later on, there is a renewal of methyl methylanthranilate in the leaves; a slighter increase is observed in the stems. The amount of terpenes in the leaves diminishes continuously, but the loss is less than the gain in the stems. N. H. J. M.

Medicinal and Nut-bearing Plants of Brazil. Theodore Peckolt (*Chem. Centr.*, 1903, ii, 1334—1337; from *Ber. Deutsch. Pharm. Ges.*, **13**, 21—38).—The abstract contains a detailed description of the quantitative composition of the following plants: *Rubachia glomerata*, *Aulomyrcia ramulosa*, *Myrcia elongata*, *Phyllocalyx tomentosus*, *Stenocalyx Michelii*, *Stenocalyx brasiliensis*, *Myrciaria cauliflora*, *Myrciaria plicata costata*, *Jambosa vulgaris*, *Psidium guayavi*, *Psidium araça*, *Psidium variabile*, *Psidium acutangulum*, *Pseudocaryophyllus sericeus*, *Campomanesia reticulata*, *Carica papaya*, and *Jacaratia dodecaphylla*. E. W. W.

Influence of Calcium Carbonate in the Decomposition of Organic Matter. P. Kossowitsch and J. Tretjakoff (*Bied. Centr.*, 1903, **32**, 805—812; from *J. exper. Landw.*, 1902, **3**, 450—484).—Oak leaves and hay (representing the herbage of the steppes) were kept for several weeks in a moist condition both without and with calcium carbonate. It was found that in absence of calcium carbonate about 50 per cent. more carbon dioxide was liberated than when calcium carbonate was present. The materials were inoculated with a little soil. Under natural conditions, the effect of calcium carbonate in the soil is to retain humus and to hinder the washing out of alumina and ferric oxide. A distinction must, however, be made between an excess of calcium carbonate in the soil, and small amounts insufficient to neutralise all the humic acid. N. H. J. M.

Chemical Changes in Cheese-ripening as Affected by Different Conditions. Lucius L. van Slyke and Edwin B. Hart (*Amer. Chem. J.*, 1904, **31**, 45—61. Compare Abstr., 1903, i, 215; ii, 388, 389, 609).—A study has been made of the influence of time, temperature, moisture, size, salt, rennet, and acid on the chemical changes which take place in the nitrogenous compounds during the ripening of cheese. The results show that the formation of nitrogenous compounds soluble in water increases with the age of the cheese, with increase of temperature, with the amount of moisture present, with the size of the cheese, with the quantity of salt present, and with the proportion of rennet employed. The presence of acid appears to be essential to the production of soluble nitrogenous compounds, but the effect of varying quantities of acid on the chemical changes has not yet been fully investigated. Paranuclein, caseoses, and peptones are present in the early stages, show a tendency to increase for a time, and afterwards decrease, whilst amino-compounds and ammonia accumulate in increasing quantities under all conditions that favour their formation. The changes in the nitrogenous compounds take place much more rapidly in the earlier than in the later stages. E. G.

Estimation of Assimilable Plant Food by Extracting the Soil with very Dilute Acids. Henrik G. Söderbaum (*Bied. Centr.*, 1903, **32**, 795—798; from *Kungl. Landtbr.-akad. handl. tidskr.*, 1903, 103—106).—Pot experiments are described in which barley was grown in loamy soil and in humus soil previously extracted for 48 hours with 2 per cent. hydrochloric acid. The series also included the same soils in their natural condition. The different pots received calcium carbonate, phosphoric acid, potash, and nitrogen, both singly and together.

The extracted loamy soil, alone and with addition of phosphoric acid (as calcium salt), potash, and nitrogen, gave no crops at all, but addition of calcium carbonate alone produced growth amounting to 56 per cent. of the growth in the unextracted soil, and when phosphoric acid and nitrogen (but no potash) were supplied in addition to calcium carbonate, the yield was a little higher than that of the unextracted soil.

The results indicate that extraction with 2 per cent. hydrochloric acid did not cause a distinct want of assimilable phosphoric acid and potash, and that the amount of nitrogen was not sufficiently reduced to prevent the plants from ripening. The assimilable constituents of the soil were therefore only partially extracted. N. H. J. M.

Influence of the Relative Amounts of Calcium and Magnesium in the Soil on the Crop Yield. OSCAR LOEW (*Chem. Zeit.*, 1903, **100**, 1225—1226. Compare Abstr., 1902, ii, 622). —The result of Gössel's water-culture experiments (*Chem. Zeit.*, 1903, 952), in which it was found that the greatest yield was obtained when the relation CaO : MgO = 0·4 : 1, is attributed to the employment of dipotassium phosphate, which would tend to eliminate the injurious effect of an excess of magnesium (compare Loew, *Flora*, 1892, 381).

Exclusive manuring with dung supplies to the soil a slight excess of readily available calcium over magnesium, and thus corrects to some extent any excess of magnesium in the soil. When mineral manures are employed, an application of calcium will be necessary, even when superphosphate is included in the manures.

In the case of most cereals, the best relation, CaO : MgO, is about 1. With other crops, especially the more leafy ones, twice or three times as much lime is required. N. H. J. M.

Composition of Beet Leaves and Heads Stored by the Rosam Process. O. FALLADA (*Bied. Centr.*, 1903, **32**, 834—836; from *Oesterr.-Ung. Zeit. Zuckerind. Landw.*, **32**, *Heft.* 1).—The leaves are heaped in the field and covered with soil. The composition of a sample of the fodder was found to be as follows:

Water.	Proteids.	Non-proteid nitrogen.	Ether extract.	Pentoses.	*N*-free extract.	Crude fibre.	Sand.
78·09	1·28	0·81	0·53	2·81	2·13	1·86	9·01

The digestibility of the crude proteid (65 per cent.) is about the same as in the fresh leaves (66 per cent.). The acid consisted mainly of lactic acid, no large amount of oxalic acid being present. N. H. J. M.

Chemical Characters of Wines from Vines Attacked by Mildew. ÉMILE MANCEAU (*Compt. rend.*, 1903, **137**, 998—1000).—The chief characteristic of wine derived from mildewed vines (the leaves were attacked, not the grapes) was an abnormally high percentage of proteids. The amount of nitrogen as ammonia was also high, and the wine contained less alcohol and more acid than the wine from vines treated with copper salts. N. H. J. M.

Manurial Value of Various Nitrogenous Manures, especially Green Manure and Farmyard Manure. ALEXIUS VON 'SIGMOND (*Landw. Versuchs-Stat.*, 1903, **59**, 179—215).—Summer barley, followed by mustard and buckwheat the same year, and by summer rape the second year, was grown in a calcareous sandy soil (92 pots), without nitrogen and with various nitrogenous manures. Two other series of experiments (each with 92 pots), similar to the first but with some modifications, are also described.

The relative action (average of series 1 and 2) of the nitrogen of the various manures as compared with nitrogen in the form of nitrate

= 100 was as follows: nitrogen as ammonia, 90; as horn-meal, 90; blood-meal, 67; cow urine, 62; dried pig dung, 57; young vetches in autumn, 78; luccerne hay in autumn and in spring, 59 and 62; rotted dung in autumn, 49; fresh dung in spring and in autumn, 41 and 50.

The relative value of dung is very similar to that indicated by Pfeiffer's pot experiments. N. H. J. M.

Action of Phosphoric Acid in Conjunction with Lime. Hermann Bachmann (*Bied. Centr.*, 1903, **32**, 801—803; from *Fühling's Landw. Zeit.*, 1903, **52**, 12).—Lime and basic slag together increased the yield of rye-grain; in the case of other phosphates, with the exception of superphosphate, the simultaneous application of lime caused no diminution in yield. The yield of oats (grain) was hardly increased at all when lime was applied with basic slag, and there was a loss of yield when lime was applied with superphosphate.

In the case of beet, the application of lime along with phosphoric acid increased the yield, except with bone-meal, when there was a slight decrease. No essential differences were observed in the leaves. The amount of lime was 1000 kilos. per hectare. N. H. J. M.

Value of "Forty per cent. Potassium Salts" as Compared with Kainite. Wilhelm Schneidewind (*Bied. Centr.*, 1903, **32**, 803—805; from *Arb. deut. landw. Ges.*, 1903, *Heft.* 81. Compare Abstr., 1902, ii, 581).—The results of experiments with mangels were irregular; kainite may be employed unless injurious to the mechanical properties of the soil. The experiments on meadow-land were indefinite. N. H. J. M.

Analytical Chemistry.

Preparation of Hydrogen Sulphide Water for use in Analysis. Karl Sander (*Zeit. angew. Chem.*, 1903, **16**, 1202).—A saturated solution of hydrogen sulphide may be conveniently prepared by having in readiness a solution of sodium sulphide (such as is used in zinc testing) and acidifying just before use with hydrochloric acid, with methyl-orange as indicator. It must, of course, be remembered that it contains sodium chloride. L. de K.

Estimation of Chlorides, Bromides, and Iodides. Stanley Benedict and John F. Snell (*J. Amer. Chem. Soc.*, 1903, **25**, 1138—1141).—The method previously described (Abstr., 1903, ii, 750) has been made a quantitative one. After estimating the total halogens as usual, the iodine and chlorine are estimated as follows, the bromine being found by difference.

Fifty c.c. of the solution are mixed with a sufficiency of potassium iodate and 5 c.c. of 50 per cent. acetic acid. This liberates the iodine, which is then removed by agitation with carbon disulphide and finally titrated with sodium thiosulphate. After expelling the bromine by adding 5 c.c. of nitric acid of sp. gr. 1·18 and boiling, the excess of potassium iodate is removed by adding potassium iodide slightly in excess of the amount necessary to react with it and repeating the boiling, if necessary, with a further addition of 2 c.c. of nitric acid. When the liquid is colourless, it is neutralised with calcium carbonate and the chlorine is estimated volumetrically, as usual. L. DE K.

Rapid Estimation of Chlorine, Bromine, and Iodine in Organic Compounds by means of Sodium Peroxide. HANS H. PRINGSHEIM (*Ber.*, 1903, **36**, 4244—4246).—The substance is mixed with 16 to 18 times its weight of sodium peroxide, ignited in a covered iron crucible by passing a hot wire through a hole in the cover, the product dissolved in water, acidified with nitric acid, and precipitated with silver nitrate. T. M. L.

Reduction of Alkali Bromates with Hydrazine Sulphate and Hydroxylamine Sulphate. MAX SCHLÖTTER (*Zeit. anorg. Chem.*, 1903, **37**, 164—171).—A series of experiments showing that bromates may be quantitatively reduced to bromides by the action of hydrazine or hydroxylamine sulphate. When the latter is used, the liquid should be strongly heated, and the reaction is slower than in the case of the former. The author recommends either of these substances instead of zinc dust or formaldehyde for the reduction of bromates. L. DE K.

Gas-volumetric Estimation of Bromates. MAX SCHLÖTTER (*Zeit. anorg. Chem.*, 1903, **37**, 172—176).—The reduction of alkali bromates by means of hydrazine sulphate (see preceding abstract) takes place according to the equation $2NaBrO_3 + 3NH_2{\cdot}NH_2 = 2NaBr + 3H_2O + 6N$. A series of experiments have shown that the volume of nitrogen evolved may serve as a measure for calculating the amount of the bromate. Hydroxylamine sulphate is less suitable, as the reaction is somewhat more complicated. L. DE K.

Reactions of Barium Peroxide with Titanosulphuric Acid. Detection of Peroxides. C. REICHARD (*Chem. Zeit.*, 1904, **28**, 16—18).—Titanosulphuric acid is reputed to be an excellent test for hydrogen peroxide, with which it produces a very permanent yellow or orange-yellow colour. The author tried its effect on barium peroxide and, as was fully expected, the same reaction was obtained. The peroxides of sodium, potassium, and calcium also gave the reaction. Efforts, however, to obtain the reaction with the insoluble peroxides or higher oxides, such as lead peroxide, manganese peroxide, cobaltic oxide, nickel trioxide, resulted in failure.

The colour produced by the barium compound is not destroyed by hydrochloric, nitric, tartaric, or oxalic acids. Alkalis destroy the colour, but this reappears on adding acid; the solution is, therefore, a good indicator. Potassium cyanide added to the acid solution gradually weakens the colour. Potassium ferrocyanide gradually turns the mixture green with production of a green precipitate. Potassium ferricyanide turns it dark brown without causing a precipitate. Zinc and sulphuric acid slowly decolorises the liquid, which then gradually turns blue. Potassium iodate has no effect.

L. DE K.

Estimation of Sulphur in Pyrites. R. SILBERBERGER (*Ber.*, 1903, **36**, 4259—4260).—Polemical. A reply to Lunge (this vol., ii, 82).

T. M. L.

Estimation of Tellurium by Electrolysis. I. GIOVANNI PELLINI (*Atti R. Accad. Lincei*, 1903, [v], **12**, ii, 312—315).—For the electrolytic estimation of tellurium, the author obtains the best results as follows: a weighed amount (0·1—0·2 gram) of pure tellurium dioxide, dissolved in 5 c.c. of concentrated hydrochloric acid, is mixed with 100—120 c.c. of a cold saturated solution of ammonium hydrogen tartrate and the liquid poured into a Classen's capsule with a matt surface, water being added to bring the total volume up to 160—170 c.c. The anode employed is a spiral of platinum wire, and the current used 0·02 ampere per 100 sq. cm. at first, and 0·014 ampere later, the voltage being 1·85—2·2; electrolysis is carried out at 55—65°, the volume of the liquid being kept constant by the addition of water. It is important not to carry on the electrolysis longer than is necessary, and to determine its completion, which requires 7—9 hours, about 2 c.c. of the solution are heated with a few drops of hydrochloric acid and stannous chloride; only a faint brown coloration should thus be produced, the reaction being as follows: $H_2TeO_3 + 2SnCl_2 + 4HCl = Te + 2SnCl_4 + 3H_2O$. Without interrupting the current, the deposited tellurium is washed, as far as possible out of contact with air; water which has been boiled and allowed to cool in a current of carbon dioxide is best used. The current is then stopped, the liquid carefully decanted off, and the precipitate washed once with dilute alcohol and several times with absolute alcohol, then dried for 15 minutes at 100° and weighed. The results obtained in this way were very good, and confirm the value 127·6 for the atomic weight of tellurium.

T. H. P.

Modification of the Pelouze-Fresenius Method of Estimating Nitric Acid. LÉON DEBOURDEAUX (*Bull. Soc. chim.*, 1904, [iii], **31**, 1—3).—The apparatus used is the same as that devised by Fresenius. The sample of the nitrate is placed in a flask through which a stream of carbon dioxide is passed to displace the air. After one hundred c.c. of a ferrous iron solution (150 grams $FeSO_4,7H_2O$, 500 c.c. of sulphuric acid, and water to 2 litres) have been added, the mixture is slowly heated until decolorised. When the solution is cold, the remaining ferrous iron can be titrated in the usual way with permanganate, and the nitrate in the original sample calculated.

S. S.

The Unsuitability of the Maercker-Bühring Solution for the Estimation of Total Phosphoric Acid in Basic Slags. H. SVOBODA (*Chem. Zeit.*, 1903, **27**, 1203—1205).—The so-called

Maercker-Bühring solution consists of a solution of 1500 grams of citric acid, and 5 litres of ammonia of sp. gr. 0·91, made up with water to 15 litres, and is used in the analysis of basic slags. The author states that this solution rapidly dissolves silica from the glass, which afterwards contaminates the magnesium pyrophosphate and so gives erroneous results. L. DE K.

Estimation of Citrate-soluble Phosphoric Acid in Basic Slags. OSKAR BÖTTCHER (*Chem. Zeit.*, 1903, 27, 1225).—One hundred c.c. of the citric acid solution of the basic slag are boiled in a 200 c.c. flask with 75 c.c. of ammoniacal citrate solution, and if after remaining for 10 minutes no precipitate is perceptible, the liquid is free from silica, and another 50 c.c. of the solution are treated as usual for phosphoric acid. Should, however, a precipitate form, the liquid is slightly acidified with hydrochloric acid and diluted to the mark. After filtering, 100 c.c. of this liquid, now free from silica, are taken for analysis. L. DE K.

Arsenious Iodide. WILLIAM DUNCAN (*Pharm. J.*, 1904, [iv], 18, 8).—The purity of samples of arsenious iodide can be readily determined by dissolving a weighed quantity of the salt in solution of sodium or potassium bicarbonate and titrating with iodine.

The anhydrous salt, prepared by crystallisation from hot carbon disulphide, is fairly stable provided that moisture is excluded. E. G.

Estimation of Rubidium and Cæsium. CLEMENTE MONTEMARTINI and G. MATTUCCI (*Gazzetta*, 1903, 33, ii, 189—201).—Gilbert's method of estimating potassium (*Diss. Tubingen*, 1898) by conversion into potassium perchlorate is applied to the estimation of rubidium and cæsium. The rubidium or cæsium is first precipitated by an excess of sodium cobalt nitrite solution, prepared according to Gilbert's method, the temperature being maintained at 40° for six or seven hours; after leaving overnight, the precipitate is collected, washed first with the reagent, subsequently with alcohol, and decomposed at 300°. The residue is extracted with boiling water and the solution evaporated to dryness several times with hydrochloric acid to convert the metal into chloride; the product is then redissolved, several c.c. of a 30 per cent. solution of perchloric acid added, and the solution evaporated to remove excess of perchloric acid. After extraction with absolute alcohol, the insoluble perchlorate is dried at 110° and weighed.

A series of analyses are given showing that this method gives good results in the presence of lithium, magnesium, calcium, barium, aluminium, iron, nickel, cobalt, and copper salts; the metals may be combined as chlorides, acetates, nitrates, and sulphates.

The composition of the precipitates obtained with sodium cobalt nitrite in the case of rubidium or cæsium is not definite, sodium always being present to the extent of 4—5 per cent. Gilbert has stated that when the corresponding potassium cobalt nitrite is precipitated in presence of such metals as iron, calcium, and magnesium, these elements are not co-precipitated; it is shown, however, that the precipitates contain considerable quantities of these metals, although this fact does not interfere with the accuracy of the final conversion into perchlorate, products being ultimately formed which are easily soluble in alcohol. W. A. D.

Reducing Action of Aluminium in Quantitative Analysis. Nazareno Tarugi (*Gazzetta*, 1903, ii, 223—233. Compare Abstr., 1902, ii, 141).—Silver can be estimated by acidifying a solution of the nitrate with sulphuric acid and adding a thin strip of aluminium to the solution; after 2 or 3 hours the silver is deposited as metal quantitatively in the form of small, lustrous crystals. On the other hand, the precipitation of copper from its sulphate in presence of sulphuric or hydrochloric acid, or from copper sulphate to which sodium potassium tartrate or potassium hydroxide has been added, is very incomplete; this is due to the formation of cuprous sulphite, which in certain dilutions is not reduced by aluminium. In presence of alkali salts, for instance, potassium sulphate, the ratio of copper found to copper used is nearly constant, namely, about 1·5, a fact which would point to the formation of a double sulphite according to the equation: $6CuSO_4 + 2K_2SO_4 + 7H_2 = Cu_2SO_3,K_2SO_3 + 4Cu + 2KHSO_4 + 4H_2SO_4 + 2H_2O$. W. A. D.

Separation of Barium, Strontium, and Calcium. Lucien Robin (*Ann. Chim. anal.*, 1903, 8, 445—447).—The nitric or hydrochloric acid solution of the three earths is neutralised with ammonia, 2 per cent. of ammonium chloride is added, and after acidifying with a little acetic acid the barium is precipitated at the boiling heat with an excess of solution of potassium dichromate. The precipitated barium chromate is first washed with a warm 2 per cent. solution of ammonium acetate, then with dilute alcohol (1 : 9), dried at 110°, and weighed. The filtrate is mixed with slight excess of ammonia, heated to boiling, and the strontium is precipitated as sulphate by adding 3 per cent. of ammonium sulphate and boiling for 15 minutes. The precipitate is washed with a one-half per cent. solution of ammonium sulphate, then with dilute alcohol, and finally ignited and weighed.

The calcium is then precipitated as usual by means of ammonium oxalate. L. de K.

[Separation of Indium and Zinc.] Correction. Carl Renz (*Ber.*, 1903, 36, 4394. Compare Abstr., 1901, ii, 657).—Indium and zinc cannot be separated by the method previously described.

J. J. S.

Rivot's Estimation of Iron in the presence of Zirconium. Karl Daniel (*Zeit. anorg. Chem.*, 1903, 37, 475—476. Compare Abstr., 1902, ii, 701; 1903, ii, 392).—A reply to Gutbier (this vol., ii, 90). L. de K.

A Delicate Reaction of Titanium. Armand Jorissen (*Bull. Acad. Roy. Belg.*, 1903, 902—907).—The author makes use of the fact that titanium sulphate gives a red coloration with salicylic acid to detect small quantities of titanium in minerals. The material is fused in a bead of acid-potassium sulphate and introduced into a solution of 0·01—0·02 gram of salicylic acid in 20—30 drops of concentrated sulphuric acid; the production of a red colour indicates the presence of titanium. The reaction may be used with substances containing cerium, aluminium, glucinum, lanthanum, didymium, thorium, zirconium, chromium, and silicon. In presence of vanadium, molybdenum, and tungsten, the test is not applicable. S. S.

Separation of Antimony and Tin with Oxalic Acid. F. HENZ (*Zeit. anorg. Chem.*, 1903, **37**, 1—58).—A lengthy investigation as to the best forms for weighing tin and antimony and their separation.

The results may be summarised as follows: *Antimony.*—The estimation as trisulphide is the most accurate, but good results are also obtained by weighing it as tetroxide according to Bunsen's original directions. If it is desired to separate the metal by electrolysis, this should be effected by using an alkaline sulphide solution mixed with sodium sulphite or potassium cyanide.

Tin.—The best method for estimating this element is the electrolytic separation from an oxalic acid solution according to Classen's method; the separation from an ammonium sulphide solution is not to be recommended, as the metal separates in a spongy condition. *Separation.*—The Clarke-Rössing method does not give a complete separation, but a good separation is effected by oxidising the alkaline solution of the sulpho-salts in the presence of potassium tartrate with hydrogen peroxide, then adding excess of oxalic acid, and precipitating the antimony with hydrogen sulphide at the boiling heat. L. DE K.

Herroun and Weller's Process for the Volumetric Estimation of Antimony. LEWIS A. YOUTZ (*Zeit. anorg. Chem.*, 1903, **37**, 337—352).—The author has critically studied the volumetric process proposed by Herroun and by Weller (Abstr., 1882, 661, 1324) and found it to be well suited for technical purposes, 99 per cent. of the antimony present being recovered. In order, however, to get trustworthy results, the following conditions should be adhered to.

The antimony sulphide, obtained from an ore in the usual manner and representing 0·2—0·25 gram of metal, is dissolved in hydrochloric acid with addition of 1 c.c. of nitric acid, and the oxidation is completed by addition of small portions of potassium chlorate. The solution is concentrated to 50 c.c. Fifteen to twenty c.c. of strong hydrochloric acid are added, and the whole is diluted to 700 c.c. After adding 3—4 grams of potassium iodide to the cold solution, the liberated iodine, which represents the antimony, is without delay titrated with standard solution of sodium thiosulphate. L. DE K.

Titration of Minute Quantities [especially of Gold]. ERWIN RUPP (*Ber.*, 1903, **36**, 3961—3965).—A reply to Maxson's criticism (Abstr., 1903, ii, 697) of the author's method for estimating small quantities of gold (Abstr., 1902, ii, 479). It is contended that Maxson's own experimental data refute his arguments, and that Gooch and Morley's method is not so accurate as that of the author. A general discussion of the errors likely to arise in estimating small quantities is based on the data arising from this special question.

W. A. D.

Separation of Gold, Silver, and Platinum. H. CARMICHAEL (*J. Soc. Chem. Ind.*, 1903, 22, 1324—1325).—The results of a series of experiments are given, from which it is seen that 7 per cent. of platinum in gold is the highest ratio that can be successfully parted. The process consisted in wrapping the alloy in sheet lead, cupelling, parting firstly in nitric acid of sp. gr. 1·162, and afterwards in nitric acid of sp. gr. 1·284. The resulting gold cornet was free from platinum. The alloy employed was composed of 0·100 gram of gold, 0·007 gram of platinum, and 0·500 gram of silver. Mass seemed to play a part in this separation, as when double these weights were taken the cornet did not part, but on increasing the proportion of gold, it parted satisfactorily.

The separation of silver in alloys of gold, silver, and platinum is best carried out by cupelling, parting the cornet with dilute sulphuric acid, washing, and then treating with concentrated nitric acid.

The wet method for the estimation of platinum in alloys was found to be untrustworthy.

In the case of ores or black sands, the separation of the osmium-iridium group from the noble metals presents no difficulty if a little silver is present. The lead button, obtained by fusing the ore in the usual manner, is boiled with dilute sulphuric acid (1 : 10), gradually allowing the acid to become more concentrated. After washing, the button is boiled with nitric acid, again washed, and finally dissolved in *aqua regia*, when the osmium-iridium group alone remains insoluble, with perhaps a trace of silver chloride, which may be removed by treatment with ammonia.

W. P. S.

Estimation of Hardness in Waters. FRIEDRICH AUERBACH (*Chem. Zeit.*, 1904, 28, 16).—The author does not agree with Drawe (*ibid.*, 1903, 27, 1219) that the slight alkalinity of water after boiling is necessarily due to alkali carbonate, but ascribes it to the presence of magnesium carbonate, which is more soluble than is generally supposed.

L. DE K.

Estimation of Hardness in Water. E. BASCH (*Chem. Zeit.*, 1904, 28, 31).—The author is inclined to agree with Drawe (see preceding abstract) that the permanent alkalinity in natural waters is due to alkali carbonate.

L. DE K.

Volumetric Estimation of *p*-Nitrotoluene in Crude Nitrotoluene. B. GLASMANN (*Ber.*, 1903, 36, 4260—4261)—The nitrotoluene is reduced with iron and hydrochloric acid, and a weighed quantity of the resulting toluidine is dissolved in ether and the *p*-toluidine precipitated with ethereal oxalic acid and well washed with ether; the oxalate is dissolved in water and titrated with decinormal sodium hydroxide, using phenolphthalein as an indicator.

T. M. L.

Estimation of Citric Acid by the Lime Method. O. von Spindler (*Chem. Zeit.*, 1903, **27**, 1263—1264).—The author has proved by a series of experiments that calcium citrate is but very incompletely precipitated on boiling its solution containing ammonium chloride and ammonia, and that the calcium process for the gravimetric estimation of citric acid is, therefore, quite untrustworthy.

L. de K.

Detection of Tartaric Acid in Citric Acid. O. von Spindler (*Chem. Zeit.*, 1904, **28**, 15—16).—A modification of Denigès's process, potassium dichromate being substituted for potassium permanganate.

0·5 gram of the acid to be tested is dissolved in 10 c.c. of water, 2 c.c. of Denigès's mercury solution (5 grams of mercuric oxide, 20 c.c. of sulphuric acid, 80 c.c. of water) are added, and after being heated to boiling, 2 c.c. of dichromate solution (5 : 1000) are introduced. When the citric acid is pure, a bright yellow precipitate forms, and the liquid remains clear yellow for several days, but in the presence of tartaric acid reduction takes place as seen by the change in colour. The method cannot be employed for the determination of citric acid, as the composition of the precipitate is not constant. L. de K.

Use of Amyl Alcohol in the Estimation of Fat in Milk by Gerber's Method. Moritz Siegfeld (*Zeit. angew. Chem.*, 1903, **16**, 1217—1220).—A series of experiments on the composition of various samples of amyl alcohol and their action with sulphuric acid of varying concentration.

The author finally arrives at the same conclusion as van Haarst (Abstr., 1903, ii, 516), that it is not safe to use a fresh supply of amyl alcohol for Gerber's process unless it has been practically tested. A yellow colour is not necessarily a bad sign. L. de K.

Detection of Albumin in Urine. Émile Dufau (*J. Pharm. Chim.*, 1903, **18**, [vi], 389—392).—The urine, which must be acid in reaction, is heated as usual in a test-tube with 0·1 c.c. of a solution of 250 grams of sodium citrate and 50 grams of alcohol in 1000 c.c. of water. Phosphates are not precipitated by this solution, but albumin is, if present. W. P. S.

Forensic Detection of Blood. Franz Utz (*Chem. Zeit.*, 1903, **27**, 1151—1152).—Meyer's process is recommended. The suspected spot is treated with an alkaline solution of phenolphthalin (obtained by reducing an alkaline solution of phenolphthalein with zinc dust) and a few drops of a 0·1 per cent. solution of hydrogen peroxide are added. If blood is present, reoxidation takes place and the colour turns pink. L. de K.

General and Physical Chemistry.

Line Spectra of the Alkalis. HEINRICH KONEN and AUGUST HAGENBACH (*Chem. Centr.*, 1903, ii, 1361; from *Physikal. Zeit.*, 4, 801).—The arc spectrum of sodium shows a number of lines which can be arranged in special series, and, on account of their number and position, suggest a comparison with the spectra of the helium group. Similar series exist in the case of lithium, but not in that of any other alkali metal, so far, at least, as the present investigation has shown. The wave-lengths of the new lines observed in the arc spectrum of lithium are 6240·8, 4636·14, 4149·1, 3924; the lines, however, are not sharply defined. A number of rubidium lines, hitherto unnoticed altogether, or not detected in the arc spectrum, have been measured and shown to belong to already known series.

J. C. P.

A New Burner for Spectra. Apparatus for collecting Gases for Lecture Experiment Purposes. ERWIN RUPP (*Zeit. anorg. Chem.*, 1904, 38, 107—109).—A description of a combined atomiser and burner for spectroscopic purposes or for furnishing monochromatic light, and also of a convenient arrangement of a glass trough and cylinders for collecting gases on the lecture table. A. McK.

Determination of Specific Rotation by Kanonnikoff's Method. ALEXEI A. PANORMOFF (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 678—687).—The author has made a number of measurements of the rotatory power of French turpentine, *l*-pinene, cholesterol, and quinine hydrochloride in chloroform solutions. The results show that Kanonnikoff's method (Abstr., 1889, 326) of deriving the specific rotation of a compound from polariscopic readings of two solutions of different concentration, and also the author's modification of this method (*J. Russ. Phys. Chem. Soc.*, 1894, 26, 193), can only be applied in special cases and not generally, since the constant A employed varies with the concentration, and x depends not only on the solvent, but also on the substance dissolved. T. H. P.

Specific Rotations of some Proteids and their Derivatives. ALEXEI A. PANORMOFF (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 688—690).—As the method used by the author in determining the specific rotations of proteids is an incorrect one (see preceding abstract), he has made new measurements to replace his previous determinations (Abstr., 1899, i, 654 and 655; Maximowitsch, Abstr., 1902, i, 66). The new values are higher than the older ones, but the changes do not affect the conclusions previously deduced. T. H. P.

Influence of Temperature on the Specific Rotatory Power of Strongly Optically Active Compounds. HERMANN GROSSMANN and HEINZ PÖTTER (*Ber.*, 1904, 37, 84—88. Compare Itzig, Abstr., 1901, i, 448 and 580).—Ammonium molybdanyldimalate,

$MoO_2(C_4H_5O_5·NH_4)_2$,

is remarkable in that its specific rotatory power increases with temperature until a maximum is reached at 35°, after which it diminishes continuously, but at a slower rate than during the increase, thus during the change of temperature from 10° to 35°, $[M]_D$ for the complex salt in a 19·343 per cent. solution increases from $-122°$ to $-129·5°$, whilst a subsequent increase of temperature to 95° only causes a decrease to $-118·9°$. The diminution of rotatory power of the complex salt with increasing dilution at the ordinary temperature is small compared with that of the dimolybdanylmalates (Itzig, *loc. cit.*) under similar conditions, thus proving a relatively greater stability.

The behaviour of potassium and sodium molybdanyltartrates, $MoO_2(C_4H_5O_6K)_2$, is normal, the specific rotatory power diminishing continuously with the temperature. But sodium molybdanyldimalate, like the ammonium salt shows a maximum rotatory power at a temperature of 50°. W. A. D.

Radioactive Substances. Sklodowska Curie (*Ann. Chim. Phys.*, 1903, [vii], 30, 145—203; 289—326).—The conclusion of the author's thesis (compare Abstr., 1903, ii, 622), comprising a full description of (1) the characteristic properties of the α-, β- and γ-rays of the radium radiation (compare Abstr., 1900, ii, 126, 254, 381); (2) their physical, chemical, and physiological effects (compare Abstr., 1900, ii, 125, 330; 1901, ii, 99; 1903, ii, 346, 462); (3) the phenomenon of induced radioactivity (compare Abstr., 1900, ii, 586; 1901, ii, 19, 215, 216, 298, 385, 589; 1902, ii, 58, 190; 1903, ii, 50, 255); (4) the atomic weight of radium (compare Abstr., 1900, ii, 83, 654; 1902, ii, 562).
M. A. W.

Analogy between Radioactivity and the Behaviour of Ozone. Franz Richarz and Rudolf Schenck (*Sitzungsber. K. Akad. Wiss. Berlin*, 1903, 1102—1106).—Freshly prepared ozone, or ozone that is decomposing under the influence of desozonising agents, accelerates the condensation of water vapour. The presence of gaseous ions, to which this phenomenon points, is confirmed by the considerable conductivity exhibited by ozone. In respect of this ability to produce gaseous ions, ozone is similar to radium and other radioactive substances. Further, a current of ozonised oxygen causes a zinc sulphide screen to fluoresce, although barium platinocyanide and zinc oxide are unaffected. Another point of analogy is the fact that radium salts and ozone both decompose with considerable development of heat. J. C. P.

Voltaic Elements founded on the Reciprocal Action of Saline Liquids and of Metallic Electrodes. Preliminary Observations on the Methods of Measurement and Conditions of Experiment. Marcellin P. E. Berthelot (*Ann. Chim. Phys.*, 1903 [vii], 30, 433—435, 435—451. Compare Abstr., 1903, ii, 51, 125).—These papers are introductory to nine others, the titles of which are appended, and contain a detailed description of the method employed and the apparatus used, in connection with which it may be stated that the electromotive force was measured by means of Arsonval's galvanometer or of Lippmann's capillary electrometer, and in working with elements involving the use of more than two liquids, a gutta percha vessel was used, divided into the necessary number of compartments by means of septa of parchment paper, cemented in position with gutta percha.

A Law relating to the Electromotive Force of Voltaic Elements Based on the Reciprocal Action of Salt Solutions and Soluble Electrolytes, and Particularly with the Reaction of an Acid and a Base (*ibid.*, 451—469. Compare Abstr., 1903, ii, 258). Law of Electromotive Forces of Salt Solutions: (1) Influence of Temperature and of Concentration (*ibid.*, 469—475. Compare Abstr., 1903, ii, 259). (2) Influence of the Nature of the Electrodes (*ibid.*, 475—487. Compare Abstr., 1903, ii, 464). Generalisation of the Law relating to the Electromotive Forces of Saline Solutions (*ibid.*, 487—506. Compare Abstr., 1903, ii, 524, 526). Researches on Voltaic Elements of One and of Two Liquids; Theoretical Relations and Verifications (*ibid.*, 506—515. Compare Abstr., 1903, ii, 525). Relations between Voltaic Elements of Several Liquids with identical or different Electrodes (*ibid.*, 515—521. Compare Abstr., 1903, ii, 625). Remarks concerning the Relationships between Galvanic Elements containing the same Liquids between two different or identical Electrodes (*ibid.*, 521—528. Compare Abstr., 1903, ii, 626). New Researches on Galvanic Elements with Several Different Liquids and Identical Metallic Electrodes (*ibid.*, 528—542. Compare Abstr., 1903, ii, 626). General Observations on Galvanic Elements with Two Liquids, Electromotive Forces, Condensations, Transformation of Energy at the Electrodes (*ibid.*, 542—554. Compare Abstr., 1903, i, 524; this vol., ii, 9). M. A. W.

Iron Salts in Voltameter Solutions. James M. Bell (*J. Physical Chem.*, 1903, 7, 652—655).—The presence of iron in the sulphuric acid solution in a hydrogen voltameter lowers materially the volume of gas evolved, but in the solution in a copper voltameter the presence of iron has but a negligible effect. These results are not contradictory, as there is an essential difference between the two cases owing to the hydrogen voltameter possessing an insoluble anode, and the author's experiments show that with a platinum anode there is also a decrease of copper deposited per ampere. The author considers the cause to be the oxidation of ferrous to ferric salt at the anode with the corresponding reduction at the cathode. L. M. J.

Action of Radium Bromide on the Electric Resistance of Bismuth. R. Paillot (*Compt. rend.*, 1904, **138**, 139—140).—The resistance of a spiral of bismuth wire is considerably diminished when the latter is placed in the neighbourhood of radium bromide. A wire of resistance $15 \cdot 1034 \times 10^{-4}$ ohms was placed 0·5 mm. distant from 0·03 gram of radium bromide (activity = 500,000); in these circumstances, the resistance of the bismuth spiral was reduced by 52×10^{-4} ohms. The action of the radium salt is instantaneous, and remains constant as long as the distance from the wire is unaltered.

S. S.

Electrical Conductivity of Solutions in Bromine. WLADIMIR A. PLOTNIKOFF (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 794—810. Compare Abstr., 1902, ii, 639).—Bromine solutions of pure aluminium bromide and also of mixtures of aluminium bromide with iodine do not conduct a current, but solutions of about 10 per cent. or higher concentration of the complex compounds, $AlBr_7,CS_2$ and $AlBr_5,EtBr,CS_2$, in bromine exhibit a conductivity which is moderately high and much greater than for more dilute solutions; thus, for solutions of various concentrations of the former compound, the values of K are as follows: 9·9 per cent., $34 \cdot 10^{-8}$; 10·3 per cent., 0·0027; 11·5 per cent., 0·0037; 14·2 per cent., 0·0053, and 29·2 per cent., 0·0057. Bromine solutions of antimony tribromide or phosphorus pentabromide also conduct.

It is possible that other "non-ionising" solvents also yield solutions capable of conducting, and this property may depend on the "conformity" between the solvent and the dissolved substance.

T. H. P.

Relation between the Conductivity of Selenium and the Intensity of the Incident Light. E. A. HOPIUS (*J. Russ. Phys. Chem. Soc.*, 1903, 35, ii, 581—583).—The author has made a number of experiments on the conductivity of selenium illuminated by means of a normal amyl acetate lamp or a Nernst lamp placed at different distances. The intensities of the currents produced were measured by special apparatus, and the values obtained show that the increase of the conductivity of selenium is approximately proportional to the cube root of the intensity of illumination. T. H. P.

Influence of Temperature on the Electrical Conductivity of Sodium. ARCIERO BERNINI (*Nuovo Cim.*, 1903, [v], 6, 21—30).—Measurements of the specific resistance of sodium in the solid and liquid states are given at temperatures from 0—130°, which shows that the metal is one of the best of metallic conductors, and that its resistance increases proportionately to the increase of temperature. The temperature coefficient is extraordinarily high; thus the resistance of the solid at 90° is 1·38484 times that at 0°, the corresponding values for mercury being 1·08615 : 1. At 0°, the conductivity is 19·84 referred to the mercury unit, at 120° (liquid), it is 10·74. The value of the ratio of the resistances in the liquid and solid state at the melting point is 1·342, referred to mercury. W. A. D.

Electrical Conductivity of Solutions of Vanadyl Trichloride in Water. A. A. AGAFONOFF (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 649—651).—The author has measured from time to time the electrical conductivities of aqueous solutions of vanadyl trichloride, which, as is known, become turbid and intensely lemon-yellow when kept for a long time in sealed vessels. He finds that the value of the conductivity undergoes a corresponding change. Thus, at 18°, a freshly prepared solution containing 1 gram-mol. of vanadyl trichloride in 74·06 litres of water has a conductivity of 179·77, which increases to 200·83 after 46 days, and diminishes to 178·34 after a further 9 days. On heating a solution 42 days old to 30°, 60°, 70°, and 80°, and cooling again to 18°, the values obtained for the conductivity were 192·95, 214·98, 218·97, and 216·96 (or, when slowly cooled, 202·93) respectively. T. H. P.

Change in the Specific Conductivity of Solutions of Salts produced by Alkali Hydroxides. Richard Ehrenfeld (*Zeit. Elektrochem.*, 1904, 10, 3—9).—Successive drops of a very dilute solution of an alkali hydroxide are added to solutions of salts, and the conductivity measured after each addition (Abstr., 1903, ii, 548). A small diminution of conductivity is produced by the first two or three drops, the succeeding drops producing an increase. This was found to be the case with the potassium salts of tartronic, tartaric, malic, tricarballylic, citric, and aconitic acids, and the sodium salts of fumaric, maleic, benzenesulphonic, picric, and lævulic acids. The phenomenon was, however, also observed in the case of salts which are known to be hydrolysed in aqueous solution, such as borax, potassium or sodium acetate, carbonate, sulphite, nitrite, and chromate, and ammonium chloride, sulphate, and nitrate. Even the salts of strong acids with strong bases, such as sodium and potassium nitrates and sulphates and sodium chloride, show it somewhat; potassium chloride was the only salt with which it could not be observed. These results lead to the view that the diminution of conductivity is due to diminution of the hydrolytic dissociation of the salts and not to the acid nature of a methylene group, as the author previously supposed (Abstr., 1903, ii, 548). T. E.

Electrical Conductivity of Solutions of Oxalic Acid in presence of Neutral Salts. A. Fedoroff (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 651—652).—Electrical conductivity measurements, by the Kohlrausch-Ostwald method, of a solution of oxalic acid containing either ammonium chloride or oxalate, show that the former of these salts diminishes the conductivity, whilst the latter increases it.

T. H. P.

Physico-chemical Properties of Aqueous Solutions of Salts of Lanthanum, Cerium, and Thorium. Knut Holmberg (*Arkiv Kem. Min. Geol.*, 1903, 1, 1—32).—The author has measured the decomposition tensions of lanthanum, cerium, and thorium chlorides in normal solutions, the results being as follows: $LaCl_3$, 1·86 volts; $CeCl_3$, 1·12 volts, and $ThCl_4$, 1·69 volts. Since $S_{Cl} = -1·31$ volts, the values of S for La, Ce (ceric), and Th are 0·55, −0·19, and 0·38 volt respectively.

Electrolytic conductivity measurements were also made at 0° and 18° of solutions of $La_2(SO_4)_3$, $Ce_2(SO_4)_3$, $Th(SO_4)_2$, $LaCl_3$, $CeCl_3$, and $ThCl_4$. The conductivities at infinite dilution are calculated to be as follows: for $La_2(SO_4)_3$ at 18°, 116, and at 0°, 76; for $Ce_2(SO_4)_3$ at 18°, 122, and at 0°, 80; for $LaCl_3$ at 18°, 112, and at 0°, 69; for $CeCl_3$ at 18°, 118, and at 0°, 72.

For measuring the hydrolytic dissociation of these salts, the author proposes to use a method based on the theory of the concentration element. Of two cylinders, the bases of which are connected by a narrow tube, one contains the salt solution to be examined, and the other the corresponding acid in equivalent quantity; in each solution is placed a large hydrogen gas electrode. Since the solution tension of the hydrogen is the same for the two electrodes, the *E.M.F.* of such a concentration element is calculated from the expression:

$$E = RT\log.c_2/c_1 + \epsilon,$$

where c_2 and c_1 are the concentrations of the hydrogen ions in the salt solution and acid respectively, and ϵ the *E.M.F.* at the surface of separation of the two solutions; c_2, which determines the hydrolytic dissociation of the salt solution, is the only unknown quantity in this equation. T. H. P.

Laboratory Apparatus for Fractional Distillation. Albert Vesterberg (*Arkiv Kem. Min. Geol.*, 1903, 1, i, 33—60).—The author has made experiments on the relative values of various types of fractional distillation apparatus, including Le Bel and Henninger's, Hempel's, a spiral condenser, a combination of the last-named with a tube containing beads, &c.

The construction of such an apparatus should be based on the following principles: (1) the path, which the vapour and condensed liquid have to traverse in opposite directions, should be as long as possible. (2) The condensed liquid should be spread over as large a surface as possible, and the contact between it and the vapour should be as intimate as possible. (3) In order that the velocity of the ascending stream of vapour may not be too great, the distillation should be carried on slowly, and the sectional area of the condenser should be tolerably great. (4) The partial condensation should not be too weak, nor so strong that the condenser becomes stopped (compare Young, Trans., 1899, **75**, 679; Abstr., 1901, ii, 86).

T. H. P.

An Apparatus for the Determination of Molecular Weights by Elevation of the Boiling Point. Johan F. Eijkman (*Chem. Centr.*, 1903, ii, 1407—1408; from *Chem. Weekblad*, 1, 47—50).—The apparatus consists essentially of three concentric tubes, of which the outermost contains the solvent and the innermost the solution. The volume of the latter can be read from a special graduation made for the purpose on the thermometer. The molecular boiling point elevations (referred to 100 c.c. of solvent) have been determined for *cyclo*hexane and *cyclo*pentane, and found to be 37—38 and 27—27·8 respectively. J. C. P.

Critical Temperatures of Solutions. I, II, and III. Mieczyslaw Centnerszwer (*J. Russ. Phys. Chem. Soc.*, 1903, **35**, 742—766, 766—793, and 897—935).—The author first gives an account of previous work done on the critical temperatures of solutions, and then describes in detail the methods of measurement of the critical temperature employed in his own investigations. The solvents made use of were ammonia, which has a critical point of 132·53° ± 0·2° on the normal hydrogen thermometer, and sulphur dioxide, the critical temperature of which is 157·26° ± 0·2° on the same scale. Solutions in these solvents of a number of organic compounds of various types (all non-electrolytes), hydrocarbons, amines, alcohols, ketones, esters, and amides, were examined, and the results obtained are given in detail.

The value obtained for the critical temperature of a liquid is dependent on the following conditions. (1) *The Extent to which the Tube is Filled.*—The temperature at which the meniscus of a pure solvent disappears when the containing tube is gradually heated and kept continually in motion depends on the amount of liquid in the tube, and, whether this is small or large, is always lower than the true critical temperature, which is obtained when the disappearing meniscus is in the middle of the tube. With solutions, however, it is otherwise, for in this case the temperature at which the meniscus disappears in a tube containing a large volume of the solution is always lower, and with small volumes higher, than the true critical temperature. These facts are shown to be in accordance with the theory of the condensation of binary mixtures. (2) *Concentration.*—The extent to which the true critical temperature (meniscus in the middle of the tube when it disappears) of a solvent is raised by a dissolved substance is proportional to the concentration of the solution, so that if ϑ_0 represent the critical temperature of the pure solvent, and ϑ that of a solution containing n gram-mols. of dissolved substance per 100 grams of solvent, $\vartheta - \vartheta_0 = Kn$, where K is a constant coefficient for a particular solvent. This expression is seen to be perfectly analogous with those connecting the depression of freezing point, rise of boiling point, &c., of a solution with its concentration. (3) *Nature of the Dissolved Substance.*—For one and the same solvent, the coefficient K has a nearly constant value for all dissolved substances, the boiling points of which under the ordinary pressure are more than 100° higher than the critical temperature of the solvent. Dissolved substances having boiling points nearer than this to the critical point of the solvent give values for K considerably less than the normal. (4) *Nature of the Solvent.*—The limited data do not allow of safe generalisation, but for ammonia and sulphur dioxide the molecular weight of the solvent divided by K gives the same number, and this is also found to be the case for chloroform.

T. H. P.

Determination of the Heats of Combustion of Alcohols of the Aliphatic Series and an Oxime.

PAWEL ZUBOFF (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 815—824. Compare Abstr., 1899, ii, 589, and 1902, i, 144).—The following heats of combustion have been determined by the author, using Regnault's value for the specific heat of water; the numbers represent calories per gram-molecule.

	Constant volume.	Constant pressure.
$C_6H_{14}O$, Pinacolin alcohol	946·3	948·0
Methyldiethylcarbinol	934·6	936·3
$C_7H_{16}O$, Triethylcarbinol	1088·7	1090·7
$C_8H_{18}O$, Methyldipropylcarbinol	1242·7	1245·1
$C_9H_{20}O$, Ethyldipropylcarbinol	1397·6	1400·2
$C_6H_{12}O$, Dimethylallylcarbinol	894·1	895·5
$C_7H_{14}O$, Methylethylallylcarbinol	1059·0	1060·7

		Constant volume.	Constant pressure.
$C_8H_{16}O$,	Methylpropylallylcarbinol	1212·0	1214·0
	Diethylallylcarbinol...............	1217·2	1219·3
$C_9H_{18}O$,	Methyl-*n*-butylallylcarbinol......	1376·3	1378·7
	Methyl-*tert.*-butylallylcarbinol...	1374·4	1376·8
$C_{10}H_{20}O$,	Dipropylallylcarbinol	1530·5	1533·2
$C_{11}H_{22}O$,	Methylhexylallylcarbinol	1680·3	1683·2
$C_7H_{12}O$,	Diallylcarbinol.....................	1037·3	1038·7
$C_8H_{14}O$,	Methyldiallylcarbinol	1191·0	1192·7
$C_{10}H_{18}O$,	Propyldiallylcarbinol	1484·7	1487·0
$C_7H_{14}O$,	1 : 3-Dimethyl*cyclo*pentanol-3...	—	1044·4
$C_8H_{16}O$,	1 : 3-Dimethyl*cyclo*hexanol-3 ...	—	1204·5
	Methyl*cyclo*heptanol	—	1201·4
	Methylethylketoxime	652·3	653·0

On comparing these values with those previously obtained (*loc. cit.*) for aromatic compounds, it is found that the heats of combustion of aliphatic compounds are slightly larger than those of the isomeric aromatic compounds. T. H. P.

Applications of the Chronostiliscope. Eugene Varenne and L. Godefroy (*Compt. rend.*, 1904, 138, 79—81).—The authors have calculated the value of n, the coefficient of internal friction of a liquid, from the equation $n = \frac{\pi}{128000K'}$, where K' is the coefficient of viscosity of the liquid determined by their special form of constant pressure capillary viscosimeter [chronostiliscope], a sketch of which is given (compare this vol., i, 2).

The same instrument can also be used for the determination of the surface tension of a liquid, calculated by Tait's law from the weight p of the drops; the value of p being given by the equation $p = (V \times 60)/(nT) \times d$, T being the time in seconds taken for the volume V of the liquid to fall in drops at the rate of n drops per 60 seconds, and d the density of the liquid. M. A. W.

Suspensions in Media of High Viscosity. Arthur Müller (*Ber.*, 1904, 37, 11—16).—The following table shows the relationship between the viscosity of a solution and the "gold-number" as determined by Zsigmondy.

		Viscosity.	Gold-number.
Gelatin	0·5 per cent.	1·443	0·005—0·01
Glue	,,	1·213	0·005—0·01
Casein	,,	1·182	0·01
Albumin I	,,	1·052	0·15—0·25
,, II	,,	1·065	
Gum [? arabic]	,,	1·082	0·15—4
Gum tragacanth	,,	1·201	about 2
Wheat-starch	,,	1·043	4—6
Dextrin	,,	1·028	6—20
Potato-starch	,,	1·020	25
Sucrose	,,	1·002	∞

With the exception of gum tragacanth and albumin, the gold-number increases steadily as the fluidity of the solution increases. The action of colloids in increasing the stability of suspensions of metallic gold is therefore due directly to their power of increasing the viscosity of the solution.

A similar result is found on attempting to precipitate the suspension by the addition of electrolytes; the colloidal solutions of high viscosity containing red phosphorus in suspension are only clarified with difficulty on adding sodium chloride. This is indicated by the following table, which shows the condition of the suspension after adding colloids of various kinds.

Phosphorus suspension.	10 per cent. NaCl solution.	Colloid.	After 24 hours.	After 48 hours.
50 c.c.	—	—	very turbid	very turbid
,,	5 c.c.	—	clear	clear
,,	,,	10 c.c. 0·5% gelatin	very turbid	very turbid
,,	,,	5 c.c. 0·5% ,,	turbid	turbid
,,	,,	10 c.c. 0·5% dextrin	turbid	nearly clear
,,	,,	10 c.c. 0·5% sucrose	scarcely turbid	clear
,,	,,	10 c.c. 25% ,,	very turbid	turbid

The viscosity of the colloid thus protects the suspension both against gravitational and electrical forces. T. M. L.

Osmosis. A. GUILLEMIN (*Compt. rend.*, 1904, 138, 38—40).—It is usual to express the equilibrium attained in a Nernst osmometer in terms of the vapour tensions of the solvent and solution and the height to which the latter rises in the vertical tube. The author objects to this on the grounds (1) that it cannot be applied to all forms of osmometer, (2) that it does not indicate the real cause which maintains equilibrium. These difficulties are avoided by considering the "tension of expansibility" or the tendency of a liquid to give off vapour; equilibrium in an osmometer is reached when this tension is the same in the liquids on each side of the membrane. This point of view renders it unnecessary to regard a non-volatile solid as existing in solution as a perfect gas, instead there has only to be considered the internal vapour pressures of the solvent and solution of the substances. S. S.

Solubility of Gases in Liquids. I. LEONARDO CASSUTO (*Nuovo Cim.*, 1903, [v], 6, 5—20).—Measurements are given of the solubility of oxygen, hydrogen, nitrogen, and carbon monoxide in water under pressures ranging from 1—10 atmospheres. The gas was confined in a graduated glass tube connected by a thick-walled tube bent twice at right angles with a cylindrical bulb containing a known quantity of water kept agitated by a small soft iron stirrer controlled by a solenoid. The values given refer to Ostwald's coefficient of solubility $\lambda = V/v$, v denoting the volume of liquid which dissolves a volume V of gas measured at the temperature and pressure of the experiment. It is shown that λ decreases in the case of hydrogen and oxygen at temperatures from 19·5—23·4° more rapidly than the pressure increases; in the case of nitrogen and carbon monoxide, the curves connecting λ and the pressure are more nearly straight lines, λ decreasing proportionately to the change of pressure. The values of λ under pressures near the atmospheric are practically constant at constant temperature, but with increasing temperature the solubility constant rapidly diminishes; thus, for hydrogen under atmospheric pressure, it changes from 0·01797 at 19·5° to 0·01728 at 23·4°. W. A. D.

Applicability of Nernst's Formula for a Mixture of Two Solvents. Gabriel Timoféeff (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 646—648).—Nernst's formula for the osmotic pressure in mixtures of solvents (*Zeit. physikal. Chem.*, 1893, 11, 1) gives, for boric acid in acetic acid and water and for benzoic acid in acetic acid and benzene, results in moderately good agreement with the experimental ones.

T. H. P.

Isotonic Coefficients of Various Salts. Gabriel Timoféeff (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 640—641).—The measurements were made with *Tradescantia discolor*, using de Vries's method, the following being the results:

	Limits of concentration (gram-mols. per litre) of plasmolysed solution.	Isotonic coefficients taking *i* for carbamide as 1.
Ammonium chloride	0·15 —0·18	1·729
,, bromide	0·135—0·18	1·665
,, iodide	0·135—0·155	1·727
Sodium chloride	0·13 —0·18	1·671
,, bromide	0·13 —0·18	1·729
,, nitrate	0·13 —0·145	1·793
Potassium chloride	0·14 —0·175	1·732
,, iodide	0·12 —0·16	1·949
,, nitrate	0·14 —0·18	1·729
Carbamide	0·27 —0·315	[1·000]

These results agree well with those obtained by de Vries and also with the values of *i* given by conductivity measurements. T. H. P.

Chemical Nature of Colloidal Solutions. Jacques Duclaux (*Compt. rend.*, 1904, 138, 144—146).—When solutions of potassium ferrocyanide and a cupric salt are mixed, a complex ferrocyanide is formed, which, according to the proportion of the reagents, may remain in suspension or may coagulate and be precipitated, but in either case it contains potassium. The composition of the precipitate can be expressed by $K_nCu_mFeCy_6$, where $m+n/2=2$. The value of n depends on the amount of the cupric salt present, thus when cupric chloride is used it varies between 1·3° and zero, the latter value being reached when the copper salt is in large excess. When a solution is made up so as to contain neither reagent in excess, the mean value of n is 0·4. It is found that the exact point of coagulation depends on the amounts taken. In the neighbourhood of the coagulation point, a slight change in the composition of the surrounding liquid produces a much larger effect on the colloid in equilibrium with it, so that the latter is very easily precipitated. The same effect can often be brought about by the addition of any salt of a polyvalent metal. S. S.

Rate of Formation of Iodates. E. L. C. FORSTER (*J. Physical Chem.*, 1903, 7, 640—651).—The author has extended the work of Schwicker on the rate of formation of iodate in alkaline solutions of iodine (Abstr., 1895, ii, 213). In Schwicker's experiments, the influence of the potassium iodide was neglected. The author finds that there is a great difference between the reactions in colourless and in brown solutions. In the former, that is, when the alkali is in excess, the rate is approximately proportional to the concentrations of the $\cdot\overline{\mathrm{OI}}$, the $\overline{\mathrm{I}}$, and the HOI. In the latter, that is, when the iodine is in excess, the results are more complicated, and it could not be stated whether such proportionality exists. The rate of formation of iodate is, however, increased by increasing the concentration of the iodine or of the potassium hydroxide, but is decreased by increasing the concentration of the iodide. By continued increase of the potassium hydroxide, so that a colourless solution is ultimately obtained, the rate passes through a maximum. Experiments at 30·4° and at 0° indicate that the temperature coefficient is lower than the customary value.

L. M. J.

Action of Sodium and Potassium Amalgams on Various Aqueous Solutions. GUSTAVE FERNEKES (*J. Physical Chem.*, 1903, 7, 611—639).—The influence of various salts on the rate of liberation of hydrogen from water by magnesium has been investigated by Kahlenberg and others (Abstr., 1903, ii, 426). The author has extended this work by replacing the magnesium by sodium or potassium amalgam. The methods employed for measuring the volume of gas liberated at various intervals of time are described. A large number of salts and also of organic compounds were investigated. Most of the salts of inorganic acids cause retardation of the rate of liberation of the hydrogen. Acids and acid salts produce an acceleration, as do also most of the organic compounds examined; this was especially marked in the case of the hydrocarbons, although they are but slightly soluble in water, for example, paraffin, vaselin, hexane, heptane, &c. Sodium sulphite also accelerates the rate. The behaviour of sodium hydroxide was anomalous; specimens prepared from sodium cause retardation, but those obtained by purification by alcohol cause a great acceleration. This the author ascribes to organic impurities, probably hydrocarbons, in the latter samples. He considers that the results are not capable of explanation by the dissociation theory, but that they may be explained on the basis of Kahlenberg's view of a chemical union between solvent and solute. L. M. J.

Action of Emulsin. Reginald O. Herzog (*Proc. K. Akad. Wetensch. Amsterdam*, 1903, 6, 332—339).—The velocity of emulsin or invertin action is determined by the equation:

$$k_1\left(1-\epsilon\right)=\frac{1}{t}l.\left(1-\epsilon\frac{x}{a}\right)\Big/\left(1-\frac{x}{a}\right),$$

where a is the concentration at the beginning, x the amount of sugar inverted in period t, k_1 the velocity constant of the reaction if taking place without autocatalysis, and k_2 the constant of the autocatalysis; $\epsilon=ak_2/k_1$. This formula is applied by the author to a number of cases studied by Henri. A. McK.

Production of High Vacua without the Use of Mercury Pumps or Liquid Air. Friedrich Krafft (*Ber.*, 1904, 37, 95—100).—Although small apparatus may be highly exhausted most conveniently by the use of mercury pumps, other methods are often desirable in the case of larger vessels. These may be exhausted by means of a water-pump, and filled four times with carbon dioxide, pumping out after each admission of gas. A 50 per cent. solution of potassium hydroxide is next introduced into a bulb connected with the apparatus, and the remaining carbon dioxide is thus rapidly absorbed. The water-vapour still present is condensed by cooling the potash-vessel with ice and salt, and finally with solid carbon dioxide and ether. The vacuum of the green cathode-light is thus reached in 15 to 30 minutes, even in the case of large vessels. When basic substances are being treated, ether or other vapours may be employed in place of carbon dioxide. A suitable arrangement of apparatus is described and figured.

C. H. D.

Hypotheses of Valency and the Course of Chemical Reactions. Arthur Michael (*J. pr. Chem.*, 1903, [ii], 68, 487—520. Compare Abstr., 1900, i, 321).—A theoretical paper, in which the valency of an atom is considered as representing the resultant of the various chemical forces influencing the atom. The importance of the thermochemical study of organic reactions is maintained. The heat of formation of fatty isomerides, having a negative nucleus in common, is greater the greater the influence of positive hydrocarbon radicles on this nucleus. Many examples are discussed, and the views of Vorländer (Abstr., 1902, ii, 250) and Thiele (Abstr., 1899, i, 554) on unsaturated compounds are criticised. The conclusions arrived at are applied to the question of the constitution of benzene, phenol, quinone, and naphthalene, and to the formation of additive compounds.

A theory of the origin of matter from two primary substances is also suggested.

The paper does not lend itself to abstraction, and reference must be made to the original. C. H. D.

Inorganic Chemistry.

Coefficient of Distribution of Hydrogen Peroxide between Water and Ether. K. Osipoff and S. Popoff (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 637—639).—The following table gives the results obtained at 17·5°:

Vol. of ether : vol. of water	½	1	2	5	6	7	8	9	10
$\frac{\text{Conc. of } H_2O_2 \text{ in ether}}{\text{Conc. of } H_2O_2 \text{ in water}}$	0·0575	0·0596	0·060	0·060	0·075	0·074	0·067	0·070	0·072

The distribution coefficients were also determined at 3° and 7°, and also the influence on them of sodium chloride and of sodium and potassium carbonates. The first of these produces no change in the coefficient, but both the carbonates cause a diminution in the solubility of hydrogen peroxide in ether. T. H. P.

The System Bromine + Iodine. H. W. Bakhuis Roozeboom (*Proc. K. Akad. Wetensch. Amsterdam*, 1903, 6, 331—332).—The boiling points of liquid mixtures, from 100 per cent. bromine to 100 per cent. iodine, and the vapours yielded by those mixtures are diagrammatically represented. Indication is afforded that a compound is produced, possibly BrI. A. McK.

The Rendering Active of Oxygen. IX. Autoxidation of Cerous Salts. Carl Engler (*Ber.*, 1904, 37, 49—59. Compare Abstr., 1903, ii, 599).—In presence of cerous salts, atmospheric oxygen is absorbed by arsenious acid, but only a single atom of oxygen is rendered active by a single atom of cerium, whilst Baur (Abstr., 1903, ii, 729) found that 1·5 atoms were. The difference is not due to side-actions, as the experiments were carried out very rapidly, especially when cerous chloride was used in place of the sulphate. T. M. L.

Separation of Sulphur by the Incomplete Combination of Hydrogen Sulphide. A Lecture Experiment. Josef Habermann (*Zeit. anorg. Chem.*, 1904, 38, 101—106).—The incomplete combustion of hydrogen sulphide according to the equation $2H_2S + O_2 = 2H_2O + S_2$, is considered as the primary cause of the occurrence of sulphur in volcanic districts. An experiment is described in support of this view. A. McK.

Molecular Weight of Sulphur in Solution. Gabriel Timoféeff (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 644—646).—The author has determined, by the ebullioscopic method, the molecular weight, of octahedral sulphur dissolved in chloroform, carbon disulphide, or benzene. The means of the results are as follows:

In chloroform, molecular weight $= 193$ ($S_6 = 192$).
In carbon bisulphide, „ „ $= 250$ ($S_8 = 256$).
In benzene, „ „ $= 151 - 313$ ($S_5 = 160$; $S_9 = 288$ and $S_{10} = 320$).

T. H. P.

Cryoscopic Observations on the Different Forms of Sulphur. S. F. Popoff (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 642—643).—The author has examined the cryoscopic behaviour of amorphous, octahedral, and prismatic sulphur in dimethylaniline and benzene. The results show that: (1) the associating power of dimethylaniline is the same as that of benzene. (2) All three modifications of sulphur exhibit identical behaviour. (3) The complexity of the molecules is directly proportional to the concentration. T. H. P.

[Tellurium Compounds.] A Correction. Alexander Gutbier and Ferdinand Flury (*Zeit. anorg. Chem.*, 1904, 38, 256).—The authors had previously indicated (Abstr., 1903, ii, 71) that certain investigators find that telluric acid cannot be obtained free from an aquamarine blue tint, possibly due to chromic oxide. This statement ought, however, to refer not to telluric acid but to telluriodates (compare Weinland and Prause, Abstr., 1901, ii, 599). A. McK.

Researches on Phosphorus and Phosphoric Acids. Henri Giran (*Ann. Chim. Phys.*, 1903, [vii], 30, 203—288).—An account of work already published (compare Abstr., 1902, ii, 318, 549; 1903, ii, 139, 197, 270, 362). The author gives details of experiments on the velocity of conversion of a solution of metaphosphoric into pyrophosphoric acid, and of pyrophosphoric into orthophosphoric acid; the former is a rapid and the latter a slow transformation. The values given in this paper for the heats of formation of the three phosphoric acids are slightly higher (0·01 to 0·11 Cals.) than those given in his former papers. M. A. W.

Formation of Arsenates from Arsenious Acid and Metallic Peroxides. O. Schairer (*Chem. Zeit.*, 1904, 28, 15).—Sodium arsenate, lead arsenate, and barium arsenate are formed by the action of sodium peroxide, lead peroxide, and barium peroxide respectively on arsenious acid. A. McK.

Equilibrium of Gases in the Bunsen Flame. Chemical Determination of Temperatures of Flames. Fritz Haber and F. Richardt (*Zeit. anorg. Chem.*, 1904, 38, 5—64).—By utilising the method of Smithells and Ingle (*Trans.*, 1892, 61, 204), the authors have determined the temperatures of Bunsen flames and compared their results with the constants obtained for the equilibrium of the gases involved. In the inner combustion zone, the equilibrium $CO_2 + H_2 \rightleftarrows CO + H_2O$ is very quickly attained, and is not appreciably altered when the gases are cooled. Accordingly, from the products of combustion in the inner zone, the temperature of the latter may be directly estimated by means of the reaction isochores of the equilibrium.

The green light from the inner zone is a luminescence phenomenon; during the establishment of the equilibrium, a greater portion of the free energy is eliminated in the form of radiation of short wave-length than should be occasioned by the temperature alone.

Quantitative determinations of the gases of the inner zone were made, and the relationships of the various concentrations are given. The ratio $[H_2O]:[CO_2]=k$ was determined gravimetrically, whilst $[CO]:[H_2]=k'$ was determined volumetrically.

The equilibrium constant $K(=k.k')$ is the same, within the limit of experimental error, as that calculated from the results of Hahn (Abstr., 1903, ii, 274). The temperature of the combustion zone determined by thermoelectrical measurements is as high in value as that calculated from the composition of the gases from the reaction isochores. The results are almost the same when the temperature is calculated from the heats of combustion and the specific heats of the gases. The results quoted were obtained with temperatures varying from 1275° to 1500°. A. McK.

Fractional Combustion of Gas Mixtures, containing Hydrogen, by Heated Palladium Wire. F. Richardt (*Zeit. anorg. Chem.*, 1904, 38, 65—91).—From a mixture of carbon monoxide and hydrogen, it is impossible to remove the hydrogen by combustion in such a manner that only carbon monoxide remains. The combustion of carbon monoxide in presence of heated palladium is complete at 300°. In presence of heated palladium wire, methane is not attacked by oxygen when the temperature does not exceed 450°. Above 450° and under a visible red heat, methane is attacked when it is in contact with the palladium wire for a sufficiently long time. When a current of methane and air is passed over palladium wire, there is little combustion even at 600—650°. The influence of hydrogen on the combustion of methane in presence of palladium has also been studied.

Ethane behaves like methane. A separation of the two gases by partial combustion is impossible. The separation of ethane or methane from hydrogen may, however, be effected by heated palladium wire.

Ethylene begins to burn at 300°. A. McK.

Reduction of Alkali Iodates and Chlorates with Hydrazine Sulphate. Max Schlötter (*Zeit. anorg. Chem.*, 1904, 38, 184—190).—Iodates and chlorates can be quantitatively reduced by hydrazine sulphate; the reduction with iodates is instantaneous, whilst that with chlorates is complete after the solution has been boiled for several hours. The changes are represented as follows: $5N_2H_4,H_2SO_4 + 4HIO_3 = 5N_2 + 12H_2O + 5H_2SO_4 + 4I$. The iodine, liberated in this manner, is then further reduced, thus $4I + N_2H_4 = 4HI + N_2$ (compare this vol., ii, 146). A. McK.

Ammonia and Metallo-ammonium Bases. I. Hans Euler (*Arkiv Kem. Min. Geol.*, 1903, 1, i, 77—91. Compare Abstr., 1903, ii, 544 and 717).—None of the hypotheses put forward in explanation of the transformation of tervalent into quinquevalent nitrogen—including those of Werner (Abstr., 1902, ii, 554), Hantzsch (Abstr., 1900, ii, 69), who introduces the idea of the hydration of the ions, Spiegel (Abstr., 1902, ii, 248), who brings forward the notion of "neutral affinities" produced by electrons, and Hinrichsen (Abstr., 1902, ii, 129)—is capable of treating this change in a quantitative manner.

According to the author's views, which are based on the ionic hypothesis and the law of mass action, the equilibrium between ammonia and ammonium hydroxide in aqueous solution is expressed by the equation: $k = K_{\mathrm{water}}/(K_2.K_2')$, in which the constants K_2 and K_2' are determined by: $C^{+}_{NH_4}.C^{-}_{OH} = K_2.C_{NH_4OH}$ and $C^{+-}_{NH_3}.C^{+}_{H} = K_2'.C^{+}_{NH_4}$. In this it is assumed that an atom of nitrogen can take up both positive and negative charges; but if the valency is considered as the action of electric charges, this is merely an expression of the fact that four positive atoms and one negative atom give, with one atom of nitrogen, a stable compound.

The above method of regarding change of valency may also be applied to the change of a double linking between carbon atoms into a single one, to the change of the degree of oxidation of a compound, for example, the conversion of cuprous into cupric oxide, &c. The following law, based on the above principles, is laid down by the author: *The compositions of all chemical compounds and molecular compounds must be regarded as a function of a force of valency* (*probably of an electrical nature*) *and also, as was done by van't Hoff, of the temperature and pressure* (*also of the solvent*). In other words: *The change of valency is due to the simultaneous splitting off of two oppositely charged ions in such quantities that their maximum dissociation product is exceeded.*

The author then gives the results of conductivity measurements of solutions of various bases in ammonia and in amines. The numbers obtained for silver oxide have already been given (*loc. cit.*). The new values arrived at are for zinc hydroxide in ammonia, cadmium hydroxide in ammonia, aluminium hydroxide in methylamine, and magnesium hydroxide in ammonia and methylamine. Concentration elements containing (1) ammoniacal and aqueous zinc sulphate solutions and (2) ammoniacal and aqueous cadmium sulphate solutions were also examined. T. H. P.

Electrolytic Separation of Metals of the Alkaline Earths. ALFRED COEHN and WILHELM KETTEMBEIL (*Zeit. anorg. Chem.*, 1904, **38**, 198—212).—Attempts were made to separate the metals of the alkalis and those of the alkaline earths by an electrolytic method. By fractional electrolysis, it was found possible to separate barium from magnesium. Saturated solutions of barium, strontium, and calcium chlorides were separately electrolysed and the results tabulated, showing the *E.M.F.*, the time required, and the yield in each case. The relationship between the yield and the *E.M.F.* is indicated; the latter was measured against a calomel electrode at 15—18°. The yields at first rapidly increase with the *E.M.F.* and then become smaller.

The differences representing the beginning of the amalgam formation with saturated solutions of the three metals are as follows:

$Ba : Sr = 0{\cdot}2$, $Sr : Ca = 0{\cdot}25$, and $Ba : Ca = 0{\cdot}45$ volt.

A quantitative electrolytic separation of barium and strontium is possible when the barium concentration is large. Similarly, when a current of 0·08 ampere was passed for 2—3 hours, it was found possible to separate strontium from calcium. A. McK.

Colloidal Properties of Calcium Fluoride. I and II.

Emanuele Paternò and E. Mazzucchelli (*Atti R. Accad. Lincei*, 1903, [v], 12, ii, 420—428 and 520—528).—When a solution of calcium chloride is added to an excess of an alkali fluoride, an immediate precipitate of calcium fluoride is formed, but on adding the alkali fluoride to the calcium salt, only a slight turbidity is produced, which redissolves on stirring, leaving a slight opalescence. Using concentrated solutions, the solubility of the calcium fluoride is only temporary, and after a short time it is reprecipitated; but in dilute solutions, months may elapse without precipitation taking place. By dialysis, solutions containing 0·15—0·25 per cent. of colloidal calcium fluoride can be obtained; these cannot be concentrated by evaporating over a water-bath or at the ordinary temperature without calcium fluoride separating at the surface, but if the evaporation be effected in a vacuum over sulphuric acid, solutions containing as much as 2 per cent. of the solid can be prepared. These solutions are rapidly precipitated by alkalis and by acids, the rapidity of precipitation being proportional to the energy of the acid; neutral salts effect the same result more slowly, the rapidity being greatest in the case of the salts of heavy metals. By non-electrolytes, for instance methyl alcohol and acetone, the colloidal solutions are not precipitated. Alkali acetates, benzoates, and succinates rapidly cause coagulation, but citrates and tartrates only act in this way when present in excess.

When an excess of calcium chloride solution is mixed with a solution of potassium fluoride containing dissolved silver fluoride, the latter is usually precipitated as silver chloride, but on diminishing the relative amount of silver fluoride it becomes more and more difficult of precipitation, and ultimately the silver chloride remains dissolved in a colloidal form in the colloidal calcium fluoride solution. On adding any of the substances which precipitate the calcium fluoride, the silver chloride is also precipitated. Similar results are obtained with silver iodide.

An excess of a calcium salt in solution is necessary to enable calcium fluoride to exist in the colloidal form. In a solution containing $CaCl_2 : 2KF$, precipitation always occurs, although with varying rapidity, depending on the concentration, being greatest at greatest concentration. Using an excess of calcium chloride, the precipitation in concentrated solution is more rapid than when an excess is not employed, but in dilute solutions the precipitation is greatly hindered or entirely prevented. A theoretical explanation of these facts is given, and the difference in the appearance of the precipitate formed under different conditions discussed.

In the precipitation of calcium fluoride from potassium fluoride by an equivalent of calcium chloride or acetate, the thermal change is not complete at once; for instance, the change $KF + \frac{1}{2}CaCl_2 + aq = KCl + \frac{1}{2}CaF_2$(insol.) + aq, which should give 2·2 Cal., after 40 seconds produces only 1·930 Cal., and after 400 seconds 2·134 Cal. in a solution containing 19 grams of fluorine in three litres. In more dilute solution, the development of heat is slower and less complete, corresponding with the greater amount of calcium fluoride held in solution. It is maintained, contrary to the usual views, that the precipitation of colloidal substances from solution may develop heat. The electrical conductivity of solutions at the same dilution which have been prepared by different methods, but yet contain the same quantities of the components of the equation, $CaCl_2 + 2KF = CaF_2 + 2KCl$, is always constant, although in some cases the whole of the calcium fluoride has been precipitated and in others a portion remains dissolved; it is thus seen that the dissolved calcium fluoride is not ionised, but exists in the molecular state. It is noteworthy that the colloidal solutions of calcium fluoride are always more or less opalescent, probably corresponding with a state of minute suspension of the solid. W. A. D.

The Fluorochlorides, Fluorobromides, and Fluoroiodides of the Alkaline Earth Metals. Edouard Defacqz (*Compt. rend.*, 1904, 138, 197—199. Compare this vol., ii, 123).—*Barium fluorochloride*, prepared by heating 10 parts of manganese fluoride and 40 parts of barium chloride for two hours at 1000°, and purified by repeated extraction with cold water and finally with alcohol at 95°, crystallises in colourless, transparent plates and has a sp. gr. 4·51 at 18°; it is insoluble in, and undecomposed by, boiling alcohol, very slowly decomposed by cold, but much more readily attacked by the boiling solvent, being thereby converted into the chloride and fluoride of barium; dilute acetic, hydrochloric, or nitric acid effects a similar decomposition; it is soluble in concentrated hydrochloric or nitric acids, whilst hot sulphuric acid decomposes it into barium sulphate, hydrofluoric and hydrochloric acids. It is not changed by fusion with manganese chloride, but converted into barium fluoride on fusion with barium chloride.

Barium fluorobromide, $BaF_2,BaBr_2$, has a sp. gr. 4·96, and barium *fluoroiodide*, BaF_2,BaI_2, a sp. gr. 5·21; the preparation and properties of these two compounds are identical with those of the fluorochloride, but they are more readily dissociated by water. M. A. W.

Preparation of Salts by Double Decomposition. Wilhelm Meyerhoffer (*Ber.*, 1904, 37, 261—265).—Referring to the preparation of barium nitrite by double decomposition of barium chloride and sodium nitrite described by Witt and Ludwig (this vol., ii, 124), the general laws underlying such changes are discussed, and it is pointed out that under the conditions of Witt and Ludwig's experiments the salt pair $Ba(NO_3)_2 + NaCl$ is stable, within its interval of change, and that in presence of water it will separate as a third salt barium chloride, sodium nitrite remaining in solution. To prevent this separation, the addition of excess of sodium nitrite is necessary.

E. F. A.

Preparation of Barium Nitrite. OTTO N. WITT and KURT LUDWIG (*Ber.*, 1904, **37**, 382—384. Compare this vol., ii, 124).—Polemical, a reply to Meyerhoffer's criticisms (preceding abstract). E. F. A.

Radium. WILHELM MARCKWALD (*Ber.*, 1904, **37**, 88—91).—*Separation of Radium from Barium.*—On adding a concentrated aqueous solution of radium barium chloride to 1 per cent. sodium amalgam, part of the sodium in the amalgam is displaced by an equivalent quantity of radium and barium, the proportion of radium absorbed being greater than that of barium; on decomposing the amalgam with hydrochloric acid, the metallic chloride obtained is much more active than the original salt. By repeating this process, a much enriched salt is obtained, but the manipulation is tedious, and the method offers little advantage over the ordinary one of fractional crystallisation.

Phosphorescence of Anhydrous Radium Barium Chloride.—It is known that anhydrous radium barium chloride exhibits phosphorescence whilst the hydrated salt fails to do so; this is due to anhydrous barium chloride showing phosphorescence with the Becquerel rays, whereas the hydrated salt is not affected.

Induced Radioactivity.—On immersing strips of various metals in a freshly-prepared solution of radium barium chloride, after 15—30 minutes they show a maximum induced radioactivity; on exposure to the air, the activity during the course of a day gradually dies away. Different metals show a different induced activity, the order, commencing with that which shows the greatest, being magnesium, tin, copper, silver, bismuth, palladium. As a rule, on dipping different strips of the same metal successively in the same solution, the inductive effect of the latter hardly changes; with magnesium, however, the second strip shows practically no induced activity, owing to a slight alkalinity imparted to the solution. On adding a drop of acid to the solution, a continuously inductive product is obtained. That the action of acid does not depend merely on its dissolving a film of oxide from the metal is shown by the fact that a solution containing ammonium chloride, which would effect this result, is not inductive. Similar results are obtained with zinc, but copper in presence of either acid or alkali becomes radioactive. W. A. D.

The Equilibrium $Mg(OH)_2 + 2NH_4Cl = MgCl_2 + 2NH_4OH$. WALTER HERZ and G. MUHS (*Zeit. anorg. Chem.*, 1904, **38**, 138—141).—The fact that magnesium salts give no precipitate with ammonia in the presence of ammonium salts follows, according to Lovén, as a consequence of the law of mass action without the hypothesis of complex compounds. The equilibrium $Mg(OH)_2 + 2NH_4Cl = MgCl_2 + 2NH_4{\cdot}OH$ has now been experimentally examined. According to the law of mass action, the equation follows $[Mg^{\cdot\cdot}]^{1\cdot5}/[NH_4] = \sqrt{K_1/4K_2^2} = K$, where $K_1 = [Mg^{\cdot\cdot}][OH']^2$ and $K_2 = [NH_4^{\cdot}][OH']$.

Magnesium hydroxide was agitated with an aqueous solution of ammonium chloride at 29°, allowed to subside, and the free ammonia titrated in an aliquot portion with nitrophenol as indicator. The constants 0·159, 0·140, 0·154, 0·152, and 0·141 were obtained. The results with ammonium nitrate were not quite so concordant.

A. McK.

Peroxides of Zinc. Robert de Forcrand (*Compt. rend.*, 1904, 138, 129—131).—Polemical. A reply to Kuriloff (this vol., ii, 36).

S. S.

Influence of the Physical Nature of the Anode on the Constitution of Lead Peroxide Deposited by Electrolysis. Auguste Hollard (*Compt. rend.*, 1904, 138, 142—144. Compare Abstr., 1903, ii, 294).—Usually the peroxide of lead deposited by electrolysis varies in composition according to the strength of the solution taken. It is shown that if the anode is made of platinum roughened by a sand blast, a peroxide of constant composition can be obtained. S. S.

Lead Salt Solutions Sensitive to Light. Karl A. Hofmann and V. Wölfl (*Ber.*, 1904, 37, 249—252).—Lead haloids in dilute sodium thiosulphate solutions are observed under the influence of light to deposit a red precipitate, whereas in diffused light or in the dark, black lead sulphide is formed. In the case of lead chloride, a polysulphide, $Pb_4S_6Cl_2$, is formed, whereas with the iodide, a copper-red powder, $Pb_3S_4I_2$, is the product; this can also be prepared by the action of yellow ammonium sulphide solution on lead iodide. E. F. A.

Constitution of the Copper-Tin Series of Alloys. Charles T. Heycock and Francis H. Neville (*Phil. Trans.*, 1903, *A*, 202, 1—69).—Details are given of work already described (Abstr., 1901, ii, 508; 1902, ii, 261). J. C. P.

Non-precipitation of Copper by Hydrogen Sulphide in the presence of Potassium Cyanide. Frederick P. Treadwell and C. von Girsewald (*Zeit. anorg. Chem.*, 1904, 38, 92—100).—The salts $[Cu_2(CN)_3H_2O]K$ and $[Cu_2(CN)_4]K_2$ are readily decomposed by hydrogen sulphide, copper sulphide being formed, whilst the salt $[Cu_2(CN)_8]K_6$ is not acted on in the solid state or in concentrated solution. The authors come to the conclusion that the non-precipitation of copper by hydrogen sulphide in the presence of potassium cyanide is due to the formation of ions containing more cyanogen than $[Cu_2(CN)_4]$, such as $[Cu_2(CN)_8]$ or possibly $[Cu_2(CN)_6]$. W. P. S.

Amalgams. Wilhelm Kettembeil (*Zeit. anorg. Chem.*, 1904, 38, 213—231. Compare this vol., ii, 168).—Three classes of amalgams are described. Firstly, the two first groups of the periodic system form amalgams so stable that they can be separated even from aqueous solutions. In the second class are included the two next groups together with boron, carbon, silicon, aluminium, and the rare earths, which form amalgams, which cannot be separated from aqueous solutions. Other metals form amalgams of the third class. When solutions of the rare earths are electrolysed with mercury cathodes, there is no formation of amalgam at the cathode. According to Nernst, a complex ion, MH_2, separates during the electrolysis of alkali salts at about 1·4 volt cathodic potential. Above this point, with one-third of the current, the formation of amalgam should occur. Below this point to that where the metal ion itself separates, no formation of amalgam could be attained, even in a freezing mixture, but evolution of hydrogen took place. It is supposed that the amalgam is formed, but is decomposed with such rapidity as to escape detection. The breaks in the decomposition potential curves observed during the electrolysis of sodium, barium, and magnesium with platinum cathodes above that of hydrogen are in the same position when mercury cathodes are employed.

Sodium amalgam forms a potassium amalgam when immersed in potassium hydroxide solution; sodium amalgam can, however, be prepared from potassium amalgam and sodium hydroxide solution.

A. McK.

Action of Radium Rays on Mercurous Salts. SIDNEY SKINNER (*Proc. Camb. Phil. Soc.*, 1904, **12**, 260—261).—Mercurous sulphate darkens rapidly on exposure to light, and it has been shown that this result is due chiefly to the ultra-violet rays, and is independent of the presence of air. The rays from radium bromide have a similar effect, the mercurous salt phosphorescing very slightly under the action of the rays. The author does not favour the view that the darkening is due to the production of mercury and mercuric salt. It is suggested that a dark sub-salt may be formed, or that a polymeric modification may be produced. In any case, the action is so small that its effect on the *E.M.F.* of a Clark cell is negligible. J. C. P.

Determination of the Atomic Weight of Rare Earths. WILHELM WILD (*Zeit. anorg. Chem.*, 1904, **38**, 191—197).—In order to determine the atomic weight of a mixture of rare earths of the didymium and yttrium group by a volumetric method, the author dissolves 0·1 gram of the oxide in 30—40 c.c. *N*/10 sulphuric acid, precipitates as oxalate with 5 c.c. of a solution of neutral potassium oxalate (1 : 5), and then titrates the excess of acid with *N*/10 sodium hydroxide solution using phenolphthalein as indicator. For a gravimetric determination of the atomic weight, the oxide is dissolved in hydrochloric acid and then converted into sulphate by sulphuric acid, the product being subsequently heated at 450—500° and quickly weighed to prevent absorption of moisture. A. McK.

Use of Bismuth as a Separating Agent in the Series of the Rare Earths. GEORGES URBAIN and HENRI LACOMBE (*Compt. rend.*, 1904, **138**, 84—85).—By an extension of the method employed for the separation of samarium and gadolinium (compare this vol., ii, 37) to large quantities of the rare earth oxides, the authors have effected the separation of gadolinum and Demarçay's europium which must thus be regarded as the first term of the yttrium earth series.

A new method of separating the elements of the rare earths is described, based also on the isomorphism of the double nitrates of magnesium and the rare earths and bismuth magnesium nitrate; after the removal of the least soluble rare earth salt by fractional crystallisation, the more soluble rare earth salt is carried down mechanically in a state of purity on the addition of a further quantity of bismuth magnesium nitrate to the uncrystallisable mother liquor. By this method, gadolinium can be separated from crude yttrium earths, which are much less rich in this element than are the xenotime earths.

M. A. W.

New Method for the Separation of Rare Earths. I. Preparation of Pure Neodymium Oxide. OTTO HOLMBERG (*Bihang K. Svenska Vet.-Akad. Handl.*, 1902—1903, **28**, ii, No. 5, 1—53).—The author has prepared the thorium, cerium, lanthanum, didymium, yttrium, and praseodymium salts of the following acids, and has determined their solubilities in water and in some cases in solutions of the corresponding acids and of their ammonium salts: tartaric, malonic, citric, benzenesulphonic, *m*-nitrobenzenesulphonic, *m*-chlorobenzenesulphonic, *m*-bromobenzenesulphonic, 3-nitro-6-chlorobenzenesulphonic, *a*-naphthalenesulphonic, 5 : 1-, 5 : 2-, and 8 : 2-nitronaphthalenesulphonic acids. His results show that the salts best suited as a means of separation of the rare earths are the *m*-nitrobenzenesulphonates, which not only show considerable differences of solubility among themselves, but also vary greatly in solubility with the temperature; they are also easily separated from the mother liquor and crystallise with the same amount of water, namely, $6H_2O$, excepting in the case of the thorium and yttrium salts, which contain $7H_2O$; further, the *m*-nitrobenzenesulphonates of the yttrium earths, gadolinium, and samarium are not isomorphous with those of the cerite metals.

From a didymium material similar to that used by Bodman (*Bihang K. Svenska Vet. Akad. Handl.*, 1900, **26**, ii, No. 3; Abstr., 1902, ii, 507), which contains neodymium, praseodymium, and samarium, and gives an atomic weight of 142·4, the author has succeeded in obtaining neodymium oxide quite free from praseodymium and samarium. Two hundred grams of the oxide were dissolved in *m*-nitrobenzenesulphonic acid and the solution submitted to a series of systematic crystallisations, by which means 12 fractions were obtained; these then underwent further fractionation. Twenty-three crystalline fractions were thus ultimately obtained, and of these the first few were found to contain samarium, whilst the next were constituted of pure neodymium salt and gave the atomic weight 143·6. The later fractions contained increasing quantities of praseodymium. T. H. P.

Separation of the Final Monazite Fractions. Preparation of Pure Gadolinium Oxide. ROBERT MARC (*Zeit. anorg. Chem.*, 1904, **38**, 121—131).—The material employed for the preparation of pure gadolinium oxide consisted of the final chromic acid fractions from several kilograms of monazite. By treatment with potassium sulphate, this was sub-divided into fractions containing yttrium, erbium, terbium, and gadolinium on the one hand, and neodymium and samarium on the other. By aid of ammonia, a further fractionation was so conducted that in one portion no erbium, and in another no neodymium nor samarium, was visible; gadolinium was present in the fraction containing no erbium. Details of the separation are given. Finally, gadolinium oxide was obtained, which, after being strongly heated, still had a faintly yellow colour, which disappears when the oxide is heated in a current of hydrogen.

Samarium oxide and neodymium oxide were also separated and examined spectroscopically. Preparations rich in terbium were also obtained. A. McK.

Sulphates of Quadrivalent Cerium. Richard J. Meyer and Arthur Aufrecht (*Ber.*, 1904, 37, 140—153).—Hot concentrated sulphuric acid converts pure ignited cerium dioxide, without dissolving it, into *anhydrous cerium sulphate*, $Ce(SO_4)_2$, no reduction taking place. The salt is washed free from sulphuric acid by glacial acetic acid and dried in a vacuum-desiccator over potassium hydroxide, and is then a deep yellow, crystalline powder. Water dissolves it at first extremely slowly, more quickly on warming, but when solution has once begun, almost unlimited quantities may be dissolved. The brown solution deposits basic salt on warming. The behaviour of ceric sulphate resembles that of ferric sulphate, and suggests that hydration or depolymerisation precedes solution. Acidified solutions deposit the known hydrated salt, $Ce(SO_4)_2,4H_2O$, on evaporation.

If ceric sulphate be overheated, or if water be present in the sulphuric acid used, reduction takes place, oxygen and ozone being evolved, and the solution deposits long, golden, glistening needles of *cerosoceric hydrogen sulphate*, $Ce_2H(SO_4)_4,13H_2O$, which dissolves in water, readily forming a supersaturated solution. On recrystallising from very dilute sulphuric acid, partial reduction to the cerous state takes place. The formulæ obtained by Mendeléeff and Muthmann and Stützel (Abstr., 1900, ii, 544) are to be thus accounted for. When ceric and cerous sulphates are mixed, a yellow, slimy substance is obtained, probably identical with the product of the decomposition of cerosoceric sulphate by water.

Sulphurous acid reduces a solution of ceric sulphate in sulphuric acid, and the cerosoceric hydrogen sulphate may be obtained in good crystals from the solution. Hydrogen peroxide also reduces ceric sulphate but cannot be applied quantitatively, as the reduction proceeds much further than is indicated by the reaction, probably from a catalytic decomposition of the hydrogen peroxide.

The analytical results of former authors are also compared, and are shown to be consistent with the above formulæ. C. H. D.

Separation of Praseodymium. C. R. Böhm (*Zeit. angew. Chem.*, 1903, 16, 1220—1224).—An historical survey of the chemistry of praseodymium is first given.

The author submitted a mixture of didymium sulphate and potassium nitrate to fractional crystallisation, whereby the separation into praseodymium and neodymium was indicated. One component of praseodymium, designated as Pr^{α}, possesses two bands, λ 596·6 and 589·6. The characteristic bands of the second component, Pr^{β}, are λ 481·1 and 444·0, whilst λ 469·0 is characteristic for Pr^{γ} (which Krüss terms Di^{η}). A. McK.

Holmium. Sven Forsling (*Bihang K. Svenska Vet. Akad. Handl.*, 1902—1903, 28, ii, No. 1, 1—21).—The author has examined the absorption spectra of solutions of different strengths of various fractions of rare earth oxides containing holmium and erbium, and gives the detailed results of the measurements. The methods used for the separation were: (1) fractionation of the chloride from hydrochloric acid solution and (2) fractionation of the dry chloride by allowing it to deliquesce and removing the liquid portion, the crystals remaining being then dried and again allowed to deliquesce and so on.

The results confirm the conclusion previously arrived at by the author that holmium is not an elementary substance, but a mixture of several components, to which correspond the different absorption bands. It appears probable that the "old" holmium consists not only of dysprosium with its two components, but that at least four other components are present. T. H. P.

Some Compounds of the Chlorides and Fluorides of Aluminium. E. Baud (*Ann. Chim. Phys.*, 1904, [viii], 1, 8—72).—This paper is principally a *résumé* of work already published (compare Abstr., 1900, 369; 1901, ii, 161, 224, 303; 1902, ii, 142, 505; 1903, ii, 150, 214), and, in addition, the preparation and thermochemical properties of some new compounds are given: (1) With ammonia, $Al_2Cl_6,2\frac{1}{3}NH_3$ is a colourless solid, distils without decomposition, and its heat of formation is +77·66 Cal.; $Al_2Cl_6,6NH_3$ has a heat of formation +167·54 Cal. (2) With hydrogen sulphide; $Al_2Cl_6,2H_2S$, dissociates at −45°. (3) With sulphur dioxide; Al_2Cl_6,SO_2, prepared by the direct union of aluminium chloride and sulphur dioxide at the ordinary temperature, distils at 200°, and its heat of solution is +150·54 Cal. at 15°, and heat of formation +18·33 Cal.; $Al_2Cl_6,2SO_2$, prepared by the prolonged action of sulphur dioxide on the preceding compound, or by the action of liquid sulphur dioxide on aluminium chloride, or by subliming the chloride in a current of the gas, is a pasty mass, dissociates at 80°, losing sulphur dioxide, to form Al_2Cl_6,SO_2; its heat of solution is +149·31 Cal., and its heat of formation +28·93 Cal. (4) With metallic chlorides; $Al_2Cl_6,2AgCl$, prepared by heating the two constituents in a sealed tube at 300°, is much less stable than the corresponding compounds with the alkali chlorides; its heat of solution is +151·45 Cal. at 22°, and its heat of formation +5·01 Cal.; $Al_2Cl_6,1{\cdot}5CaCl_2$, melts below 300°; its heat of solution is +173·4 Cal. at 16°, and its heat of formation +9·28 Cal.; $Al_2Cl_6,1{\cdot}5SrCl_2$, melts below 300°; its heat of solution is +164·39 Cal. at 19°, and its heat of formation +8·71 Cal.; $Al_2Cl_6,BaCl_2$, melts at 290°, and crystallises in silky scales resembling some specimens of natural spinel; its heat of formation is +5·29

Cal.; when heated at 500°, it loses aluminium chloride and forms $Al_2Cl_6,1\cdot5BaCl_2$, the heat of formation of which is $+7\cdot30$ Cal.; $Al_2Cl_6,1\cdot5ZnCl_2$, is a pasty, translucent mass, less stable than the preceding compounds; its heat of solution is $+187\cdot99$ Cal. at 15°, and its heat of formation is negative.

The double alkali chlorides, $Al_2Cl_6,2MCl$, absorb ammonia to form compounds of the type $Al_2Cl_6,2MCl,12NH_3$; the heat of solution of the sodium compound is $+11\cdot23$ Cal. and the heat of formation $+255\cdot87$ Cal.; the corresponding values for the ammonium compound are $-5\cdot47$ Cal. and $+252\cdot08$ Cal., and for the potassium compound $-6\cdot08$ Cal. and $+252\cdot19$ Cal. M. A. W.

Indium. ALFRED THIEL (*Ber.*, 1904, 37, 175—176. Compare C. Renz, this vol., ii, 149, and A. Sachs, *ibid.*, 38).—Indium has been prepared by the electrolysis of solutions of pure salts. It has a sp. gr. 7·12 at 13°/4°, and its melting point, determined by different methods, is 155°.

Analyses of the pure sublimed trichloride give $115\cdot08 \pm 0\cdot03$ as the atomic weight, and this value has been confirmed by experiments with the bromide and oxide [details and standard not given]. The oxide forms glistening rhombohedra with the colour of chlorine. The *sulphide*, In_2S_3, is a scarlet-red powder with a high metallic lustre, and the *monosulphide*, In_2S, is volatile, and forms a blackish-brown powder or minute yellowish-brown crystals. The *fluoride*, $InF_3,3H_2O$, forms glistening crystals, is strongly doubly refractive, moderately soluble, and readily decomposed. The *oxychloride*, InOCl, is a sparingly soluble white powder. The *bromides*, InBr and $InBr_2$, resemble the chlorides. Indium separated electrolytically has a colour between that of silver and platinum; platinum cathodes are attacked as the metal alloys with indium. The pure metal is extremely soft, and may be obtained in the form of wire by the aid of a sodium press. J. J. S.

Atomic Weight of Iron. II. Analysis of Ferrous Bromide. GREGORY P. BAXTER (*Zeit. anorg. Chem.*, 1904, 38, 232—245).—Ferrous bromide was prepared by heating iron in a current of dry nitrogen and hydrogen bromide at a temperature sufficient for the sublimation of the ferrous bromide. The sublimate was heated for a considerable time in a current of dry nitrogen and hydrogen bromide until it showed no trace of ferric salt when tested with ammonium thiocyanate. The salt, prepared in this manner, is stable in dry air; its colour varies from light yellow to dark brown.

The ferrous bromide was first oxidised by potassium dichromate and sulphuric acid, silver nitrate was then added to the solution, and the resulting silver bromide filtered off in a Gooch crucible, heated at 200° in an electrical oven, and then weighed. As a mean of four determinations, in two of which the silver obtainable from the bromide was also weighed, the value obtained for the atomic weight of iron was 55·857 ($O=16$), being somewhat smaller than that obtained by the analysis of ferric oxide, which was 55·883 ($O=16$). The value 55·88 ($O=16\cdot000$) may accordingly be taken for the atomic weight of iron.

Ferrous bromide has the sp. gr. 4·636 at 25°/4°. A. McK.

Pulverisation of "Nickel Grains" in Fuming Nitric Acid. W. A. Hollis (*Proc. Camb. Phil. Soc.*, 1904, 12, 253—259).—When a nickel grain is dropped into fuming nitric acid, the metal may be violently attacked, or it may become passive, or it may be slowly disintegrated, yielding a greyish-white powder with a dull metallic lustre. The powder is not pyrophoric, but is strongly magnetic. The disintegration is accompanied by slight chemical action, gaseous bubbles are formed, and the liquid becomes green. Evidence of pulverisation was obtained also on treating nickel "shot" in a similar manner. J. C. P.

Tungsten Compounds. Emil Schaefer (*Zeit. anorg. Chem.*, 1904, 38, 142—183).—According to Hallopeau (Abstr., 1899, ii, 32, 555), two potassium tungsten bronzes exist having the composition $K_2W_3O_9$ and $K_2W_5O_{15}$ respectively, whilst the compound isolated by Knorre is represented as $K_2W_4O_{12}$. Hallopeau's results are criticised, and it is experimentally shown that they are incorrect. Potassium tungsten bronze, prepared by fusing together a mixture of potassium carbonate and tungstic acid and then reducing the mass by coal gas or hydrogen, gave on analysis values corresponding with the formula $K_2W_4O_{12}$. The same bronze is also obtained when the molten mixture of potassium carbonate and tungstic acid is reduced by zinc.

Negative results were obtained when attempts were made to prepare thallium tungsten bronze. No definite compound was obtained from rubidium carbonate and tungstic acid.

Rubidium pentatungstate, $Rb_2W_5O_{16}$, prepared from rubidium oxide (1 part) and tungstic oxide (3—3·5 parts), forms glistening, rectangular leaflets. *Rubidium octatungstate*, $Rb_2W_8O_{25}$, was obtained in admixture with some bronze. *Thallium paratungstate* probably has the composition $5Tl_2O,12WO_3$; prepared from sodium paratungstate and thallous sulphate, it forms a white, amorphous precipitate. *Rubidium paratungstate*, $5Rb_2O,12WO_3,18H_2O$, forms white, rhombic leaflets.

When an aqueous solution of normal sodium tungstate, Na_2WO_4, is electrolysed in a cell where the electrodes were separated by a diaphragm, sodium paratungstate, $5Na_2O,12WO_3$, is formed so long as the liquid in the neighbourhood of the anode reacts alkaline; as the electrolysis proceeds, the liquid at the anode gradually becomes neutral and then acid, and at the latter stage, sodium metatungstate, $Na_2W_4O_{13}$, is formed. Finally, tungstic acid hydrate is formed at the anode and sodium hydroxide at the cathode. The electrolysis of potassium tungstate proceeds in an analogous manner. When ammonium tungstate is used, the decomposition is complicated owing to rise of temperature and endosmosis taking place, but the results are on the whole analogous to those obtained with the alkali tungstates (compare Engels, this vol., ii, 129).

A. McK.

Derivatives of Complex Inorganic Acids. III and IV. Allen Rogers and Edgar F. Smith (*J. Amer. Chem. Soc.*, 1903, 25, 1223—1227, 1227—1229).—The following salts have been prepared and analysed. *Ammonium silicovanadosophosphotungstate, ammonium titanovanadosophosphotungstate, ammonium zirconovanadosophosphotungstate, ammonium thorovanadosophosphotungstate*, and *ammonium stannivanadosophosphotungstate*. These salts separate from a concentrated, aqueous solution in large, brilliant black, octahedral crystals; their reactions with solutions of various acids, alkalis, and salts are described; although concordant results are obtained on analysis, the formulæ deducible from them are very complex; further work is therefore being undertaken on the subject.

Ammonium vanadosotungstate, $3(NH_4)_2O,V_2O_3,8WO_3,10H_2O$, is a crystalline salt which is very soluble in water. *Ammonium vanadicosotungstate*, $5(NH_4)_2O,2V_2O_4,14WO_3,13H_2O$, forms black, well-defined, octahedral crystals and is very soluble in water. The behaviour of the salts with various reagents is described. E. G.

Derivatives of Complex Inorganic Acids. V. Clarence W. Balke and Edgar F. Smith (*J. Amer. Chem. Soc.*, 1903, **25**, 1229—1234).—*Ammonium aluminotungstate*,

$$3(NH_4)_2O,Al_2O_3,9WO_3,4H_2O,$$

is obtained as a dense, highly refractive syrup which, on drying, forms a semi-transparent mass. *Silver ammonium aluminotungstate*,

$$11Ag_2O,21(NH_4)_2O,4Al_2O_3,36WO_3,$$

is a yellow, crystalline salt, insoluble in water. *Ammonium bismuthotungstate*, $3(NH_4)_2O,2Bi_2O_3,11WO_3,10H_2O$, is obtained as an oil which, when dry, forms a yellow, transparent, vitreous mass. The corresponding *potassium* salt, $3K_2O,2Bi_2O_3,11WO_3,15H_2O$, separates as an oil which, on drying, yields a transparent, pale yellow, vitreous mass. The *strontium* salt, $3SrO,2Bi_2O_3,11WO_3,11H_2O$, is obtained as an oil which, on cooling, solidifies to a wax-like mass; when dried at 100°, it forms a hard yellow, vitreous mass and is insoluble in water. An account is given of the action of various reagents on these salts. E. G.

Pyrophoric Bismuth. Paul Thibault (*Bull. Soc. chim.*, 1904, [iii], **31**, 135—137).—See this vol., i, 247.

Crystallised Polysulphides of the Heavy Metals. Karl A. Hofmann and F. Höchtlen (*Ber.*, 1904, **37**, 245—249. Compare Abstr., 1903, ii, 728).—*Gold ammonium polysulphide*, AuS_3NH_4, is obtained in glistening, yellow, flat, rhombic prisms on allowing a mixture of aqueous gold chloride and ammonium polysulphide to remain for several days at a temperature of 5°. In absolute ethereal solution, gold chloride gives a dark brown precipitate of *auric sulphide*, Au_2S_3. *Iridium ammonium pentadecasulphide*, $IrS_{15}(NH_4)_3$, crystallises in large, brown, octahedral crystals of the tetragonal system [$a : b = 0{\cdot}915 : 1$].

Palladium ammonium undecasulphide, $PdS_{11}(NH_4)_2,\frac{1}{2}H_2O$, crystallises in yellowish-red, glistening needles. Bismuth chloride forms with ammonium polysulphide a compound crystallising in glistening, black prisms which contains oxygen, and probably has the constitution $S_2[Bi(S_2O_3NH_4)\cdot S_4NH_4]_2$. E. F. A.

Colloidal Metals of the Platinum Group. I. Carl Paal and Conrad Amberger (*Ber.*, 1904, **37**, 124—139).—The method employed to prepare colloidal solutions of silver, gold, &c., by means of protalbic and lysalbic acids (Abstr., 1902, i, 653; ii, 500, 503, 508) may be extended to the platinum metals. A solution of chloroplatinic acid is added to an alkaline solution of sodium lysalbate or protalbate, and an excess of hydrazine hydrate is then added. The salts produced are removed by dialysis and the remaining liquid is concentrated on the water-bath, and finally in a vacuum. The product, dried at 100°, forms black, glistening scales dissolving readily in water to a dark brown, opalescent solution. Acetic acid precipitates the platinum, but the product rapidly passes into the insoluble modification. Electrolytes precipitate the hydrosol from its solutions without formation of the hydrogel. Colloidal preparations of palladium are obtained in similar manner, and have similar properties. Colloidal iridium is prepared by employing sodium amalgam as the reducing agent, or by passing gaseous hydrogen through the heated solution of sodium lysalbate and iridium chloride. The product resembles those from platinum and palladium, but has a much weaker catalytic action on hydrogen peroxide.

C. H. D.

Platinic Acid. Italo Bellucci (*Atti R. Accad. Lincei*, 1903, [v], 12, ii, 635—642. Compare Miolati and Bellucci, Abstr., 1900, ii, 732; 1901, ii, 246; Bellucci, Abstr., 1902, ii, 267; 1903, ii, 155).—The hydrated platinic oxide, $PtO_2,4H_2O$, is probably the acid $Pt(OH)_6H_2$, corresponding with chloroplatinic acid, H_2PtCl_6; on dissolving it in aqueous sodium or potassium hydroxide and slowly evaporating the yellow solution obtained on the water-bath, crystals of the *salts*, $Pt(OH)_6Na_2$ and $Pt(OH)_6K_2$, are obtained. That these salts correspond with the formulæ given to them and are not mere hydrates of PtO_3Na_2 or PtO_3K_2, appears to be proved by the fact that they do not lose water at 100—110°, and that their aqueous solutions give with silver or thallous acetates, precipitates of the composition $Pt(OH)_6Ag_2$ and $Pt(OH)_6Tl_2$, which are also stable at 100°. Moreover, when water has been eliminated from the salts by heating them at a high temperature, they do not easily become rehydrated. The acid which they regenerate when treated with acetic acid always has the composition $Pt(OH)_6H_2$.

W. A. D.

Mineralogical Chemistry.

Carbonaceous Substances accompanying the Caucasian Naphtha Deposits. K. W. Charitschkoff (*J. Russ. Phys. Chem. Soc.*, 1903, **35**, 695—701).—In some regions of the Caucasus (Grosny and Tschatma in the Tiflis government), the naphtha is accompanied by coal in the form of layers, alternating regularly with the naphtha strata. In composition, this coal closely resembles brown coal, from which it differs only in containing less water and in being slightly hygroscopic. The Grosny coal contains large proportions of salts and sulphur; that from Tschatma occurs in two modifications; one, brown with a high salt content, and the other black, resembling ordinary coal, but containing less sulphur, nitrogen, and moisture than this. The intimate connection between this coal and the naphtha suggests that the former is a product of the metamorphosis of the latter, of its hydrogenation by the slow action of sulphur and heat. This view is supported by the formation of hydrogen sulphide from sulphur and naphtha and by the occurrence of coal in the pipes used for conveying heated naphtha. Further, the possibility of the formation of coal from hydrocarbons has been shown by Höfer's recent discovery of pseudomorphs of anthracite after argentite; the formation of these pseudomorphs is expressed by the equation: $2Ag_2S + CH_4 = 4Ag + 2H_2S + C$. T. H. P.

Constitution, Origin, and Dehydration of Laterite. THOMAS H. HOLLAND (*Geol. Mag.*, 1903, 10, 59—69. Compare Abstr., 1899, ii, 565).—Laterite is not a ferruginous clay, but is essentially identical with bauxite, the alumina being present in the form of hydrated oxides. It is a product of superficial weathering in tropical climates, brought about, it is suggested, by the action of low organisms, possibly akin to the so-called nitrifying bacteria. Kaolin, on the other hand, is of deep-seated origin. The spontaneous loss of water experienced by laterite is accompanied by the development of a concretionary, and, in places, of a microcrystalline structure: this appears to correspond with a gradual exothermic change from gibbsite, $AlO(OH),H_2O$, to the more stable diaspore, $AlO(OH)$, the "crystalline affinity" of the latter compound being greater than the chemical affinity of the former.

L. J. S.

Composition of Indian Laterite. H. WARTH and F. J. WARTH (*Geol. Mag.*, 1903, 10, 154—159; and *Chem. News*, 1903, 87, 256—258. Compare preceding abstract).—Twenty-three analyses are given of laterite from various localities in India. One of them corresponds with gibbsite (Abstr., 1902, ii, 328); four with the purer variety of bauxite known as wocheinite; eight with ferruginous bauxite (Fe_2O_3, 13·75—56·01 per cent.); and the remainder, which are "low-level" detrital laterites, with bauxite largely mixed with quartz-sand and clay. In the "high-level" laterites occurring *in situ* of the first three of these groups, the combined silica (present as clay) varies from 0·23 to 4·20 per cent., being often less in amount than the titanium dioxide (probably present as ilmenite), which reaches 6·61 per cent. in one sample of the wocheinite variety. L. J. S.

[Blue Apatite] in the Tiree Marble. ANANDA K. COOMÁRA SWÁMY (*Q. J. Geol. Soc.*, 1903, 59, 91—103).—A description is given of the pink, grey, and white marbles which occur as lenticles in the gneiss near Balephetrish in Tiree. The minerals present in the marbles are: calcite, dolomite, pyroxene, amphibole, forsterite, scapolite, mica, sphene, apatite, orthoclase, spinel, and serpentine. The apatite occurs as elongated grains of a bright sky-blue colour in coccolite-scapolite-sphene aggregates in the pink marble; analysis, by W. C. Hancock, gave:

CaO.	P_2O_5.	Cl.	SiO_2.	H_2O (hygroscopic).	Total.	Sp. gr.
53·92	39·55	1·85	1·5	3·16	99·98	3·20

This occurrence is very similar to that of blue apatite in Ceylon (Abstr., 1901, ii, 111, 171; 1902, ii, 567). L. J. S.

[Nephelite, Laumontite, Baryto-celestite, &c.] William Pollard (*Summary of Progress, Geol. Surv. United Kingdom* for 1902, 1903, 56—61).—The following mineral analyses are given: I, nephelite, from a boulder of nephelite-ægirite-syenite-pegmatite at Coulmore, Ross-shire (compare Abstr., 1903, ii, 378). II, a white alteration product of nephelite (?) from a vein east of Ault a Mhullin. III, laumontite, from the Baveno granite quarries, Italy. IV, baryto-celestite, from the Chipping Sodbury railway-cutting, Gloucestershire.

	SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.	K_2O.	Na_2O.	Li_2O	CO_2.	SO_3.	H_2O at 105°.	H_2O above 105°.	Total.
I.	44·87	32·00	1·53	0·47	—	6·72	14·00	—	—	—	0·11	0·87	100·57
II.	43·35	31·93	0·78	1·53	0·28	6·16	8·03	0·15	0·57	1·67	0·38	5·47	100·30
III.	51·35	22·14	0·67	12·35	—	—	—	—	—	—	13·65		100·16

	BaO.	SrO.	CaO.	SO_3.	Fe_2O_3.	Loss on ignition.	Total.
IV.	24·48	31·89	1·22	39·03	1·26	1·81	99·69

In some basic, igneous rocks from Scotland, small amounts (0·01—0·06 per cent.) of chromium and vanadium were found. Analyses are also given of phosphatic nodules, clay, mottled dolomitic limestone, and of pumice separated from the volcanic dust which fell in Barbados on May 7—8, 1902. L. J. S.

Physiological Chemistry.

Action of Pilocarpine and Atropine on Embryos. Torald Sollmann (*Amer. J. Physiol.*, 1904, 10, 352—361).—Small doses of pilocarpine hasten the development of echinoderm embryos; larger doses or prolonged action produces the opposite result. Small doses of atropine have no effect; larger doses hinder development. When both drugs are used, the depressant action always predominates, and the observed resultant is always below the mathematical average.

W. D. H.

Specific Gravity of Blood. EMIL P. BAUMANN (*Brit. Med. J.*, 1904, 473—474).—Hammerschlag's method is easily available for clinical purposes and yields trustworthy results, provided that the uniform excess, which Levy showed is associated with the use of a hydrometer, is obviated by having the instrument specially standardised. W. D. H.

Effect of Altitude on the Blood. GEORGE T. KEMP (*Proc. Amer. Physiol. Soc.*, 1903, xxxii—xxxv; *Amer. J. Physiol.*, 10).—Examinations of the blood in several healthy people were made at Cripple Creak (9,400 feet) and Pike's Peak (14,200 feet), and compared with those made at Champaign (700 feet). Details of the rapid increase of red corpuscles are given; in the morning, the small usual rise was at great altitudes increased to 1,000,000 per c.m. Another marked effect is an enormous rise in the number of platelets; many are increased in size; small, red corpuscles are also numerous, and a few nucleated ones are seen. The leucocytes are unaffected. The daily fluctuations in hæmoglobin are very great, but generally, although not always, run with the variations in the number of the corpuscles. Specific gravity is no index of the number of red corpuscles.
W. D. H.

Is there Free Glycerol in Normal Blood? ANTOINE MOUNEYRAT (*Compt. rend. Soc. Biol.*, 1903, 55, 1438—1440, 1596—1598, 1599—1600).—Polemical against Nicloux, who answers this question in the affirmative (compare Abstr., 1903, ii, 438, 560, 660).
W. D. H.

Oxidation of Dextrose in the Blood. LEOPOLD JOLLY (*Compt. rend.*, 1903, 137, 771—772).—Alcohol in minute quantities exists in the blood, and is believed to originate from sugar; the corpuscles are stated to effect the oxidation, and also to carry it further by converting some of the alcohol into acetic acid. W. D. H.

Increase in the Glycolytic Power of the Blood after Ligature of Wirsung's Duct. RAPHAEL LÉPINE and BOULUD (*Compt. rend. Soc. Biol.*, 1903, 55, 1444—1445).—After the ligature of the pancreatic duct in dogs, and the administration of acidified water to excite secretion from that organ, the glycolytic power of the blood is increased. W. D. H.

Amount of Proteids in Blood Plasma. JOHANN LEWINSKI (*Pflüger's Archiv*, 1903, 100, 611—633).—In human blood-plasma, the amount of serum-albumin is always greater than that of serum-globulin, the percentage of the former varying between 3·3 and 4·5, and of the latter between 2·4 and 3·8; fibrinogen varies between 0·27 and 0·48 per cent. During normal pregnancy, no noteworthy differences were seen; in puerperal eclampsia, the total proteid is somewhat lessened, and the fibrinogen increased. A large number of observations on the amount of the blood proteids in the lower animals are given. In all except the horse, serum-albumin is the most abundant proteid. The results of alternate periods of feeding and inanition in dogs are inconstant, except that all show a slight rise in the amount of serum-globulin during inanition.

W. D. H.

Proteids of Blood-plasma in Experimental Infections. Leo Langstein and Martin Mayer (*Beitr. chem. Physiol. Path.*, 1903, 5, 69—82).—Under the influence of pneumococcus and streptococcus infection, there is a great increase in the fibrinogen of the blood plasma. It is not so marked in other infections which were tried. The increase of fibrin yield and globulin in inflammatory conditions in man has been noted previously by Halliburton and others. In normal rabbits, the proteid quotient (globulin : albumin) is 1 : 2. In almost all infections this rises and may reach 1 : 1. The total proteid is also usually increased. W. D. H.

Changes in the Blood by Injection of Proteid. Leopold Moll (*Beitr. chem. Physiol. Path.*, 1903, 4, 578—589).—Rabbits and dogs were injected with a foreign proteid (horse-serum), as in experiments on immunity. The total proteid in their blood remained constant, but the globulin was increased, the increase being especially seen in the euglobulin fraction. Whether this is related to the development of the precipitin reaction is discussed, and in its favour it was found that, in the precipitate, the globulin of the immune serum alone participated. In this reaction, the proteid of the immune serum is the passive reagent; the precipitin it contains is the substance precipitated; precipitin and precipitate stand in relation to each other in the same way as fibrinogen and fibrin. W. D. H.

Lipase of the Blood. Charles Garnier (*Compt. rend. Soc. Biol.*, 1903, 55, 1423—1425, 1425—1427. Compare Abstr., 1903, ii, 560, 583, 660).—The lipasic power of human serum was tested in various diseases, infections, and poisonings. Such observations are stated to be of diagnostic value in certain cases, for instance, the power is increased in diabetes and lessened in latent gastric neoplasm. Return to the normal is favourable from the prognostic point of view.

W. D. H.

Action of Radium Emanations on Hæmoglobin and Red Corpuscles. Victor Henri and André Mayer (*Compt. rend. Soc. Biol.*, 1903, 55, 1412—1414, 1414—1416).—The action of radium emanations on a solution of hæmoglobin is to transform it gradually into methæmoglobin. At the same time, the solubility of the substance diminishes. The action of the emanations on the red corpuscles is to modify their osmotic properties, so that they part with their pigment to isotonic solutions, and in relation to hypotonic solutions, they part with pigment and salts more than normal corpuscles do.

W. D. H.

Influence of Hæmorrhage on Proteid Katabolism. Philip B. Hawk and William J. Gies (*Proc. Amer. Physiol. Soc.*, 1903, xxviii—xxix; *Amer. J. Physiol.*, 10).—Hæmorrhage in dogs does not affect the fæces. The urine is entirely stopped for half an hour if the hæmorrhage amounts to 3 per cent. of the body weight, then follows a stage of diminished secretion and diminished specific gravity of the urine; 24 to 48 hours later, the reverse is seen. The nitrogen and sulphur show a slight temporary increase, the phosphorus a decrease. Repeated hæmorrhages produce cumulative katabolic effects.

W. D. H.

Influence of Hæmorrhage on Lymph. E. R. Posner and William J. Gies (*Proc. Amer. Physiol. Soc.*, 1903, xxxi—xxxii; *Amer. J. Physiol.*, **10**).—After hæmorrhage in both well-fed and fasting dogs, the flow of lymph from the thoracic duct is diminished; the percentage of organic solids sometimes rises, sometimes falls, the ash remaining constant and equal to that of the blood. Sodium chloride injections produce as well-marked lymphagogue effects as in a normal animal.

W. D. H.

Uptake of Iron by the Human Placenta from the Maternal Blood. I. J. Hofbauer (*Zeit. physiol. Chem.*, 1903, **40**, 240—248).—The uptake of iron from the blood by the placenta is undoubted, and the power of splitting up the iron compounds resides in the chorionic cells.

W. D. H.

Blood Supply and Nutrition of the Pancreas. Otto May (*J. Physiol.*, 1904, **30**, 400—413).—The pancreas is well supplied with vaso-constrictor nerves. After injection of secretin, there is well marked vaso-dilatation, as shown by the plethysmographic method. This is secondary to secretion, and probably the result of the action of katabolic products on the vessels. No direct relation exists between rate of secretion and extent of blood supply in this organ. Secretion continues after cessation of the circulation.

W. D. H.

Metabolism Experiments. William J. Gies (*Proc. Amer. Physiol. Soc.*, 1903, xxii—xxiii; *Amer. J. Physiol.*, **10**).—Improved methods for performing metabolism experiments on dogs are described, and also a new form of cage to allow of easy quantitative collection of excreta. Bone ash is a desirable addition to the diet; it increases the bulk of the fæces, and ensures frequent and regular discharges; they also dry quickly and do not adhere to the cage. Charcoal is used to mark off periods.

W. D. H.

Metabolism following a small increase in Proteid Ingested. Philip B. Hawk and Joseph S. Chamberlain (*Amer. J. Physiol.*, 1904, **10**, 269—289).—The experiments were made on man. The nitrogen excretion, measured by three hour periods, showed two maxima daily; it rises from the morning meal to mid-day, then falls, and rises again about the time of the evening meal. Measured by shorter periods, a third rise occurs between the other two. In general terms, the sulphates run a similar course. The rises in phosphate excretion occur later. After taking a small amount of extra proteid food, the time required to reach the maximum is prolonged, and the prolongation is greater when the increase of proteid is greater. Alterations were also noted in the course of the excretion of the salts. The normal was not regained until four days later. W. D. H.

Nitrogenous Metabolism after Splenectomy. Lafayette B. Mendel and Robert B. Gibson (*Proc. Amer. Physiol. Soc.*, 1903, xxix—xxx; *Amer. J. Physiol.*, 10).—In a case of splenectomy in man, the character of the curves of post prandial excretion of uric acid and other nitrogenous constituents of urine was normal; chlorides were retained during febrile conditions; the organism's capacity to form uric acid from purine substances in the food was undiminished, and there is a relatively large output of endogenous uric acid; the excretion of urobilin was marked at times. Possibly the two latter conditions were due to impaired hepatic conditions. W. D. H.

Origin of Sulphur-containing Products of Metabolism in the Animal Organism. Julius Wohlgemuth (*Zeit. physiol. Chem.*, 1903, 40, 81—100).—In the rabbit, cystin causes an increase in the urinary sulphates and in the non-oxidised sulphur. In the normal animal, the ratio of neutral sulphur to oxidised sulphur is 1 : 4; after dosing with cystin it is 1 : 2. Sulphites are also present. If cystin is given by the mouth, the sulphur of the bile is increased, cystin being converted into taurine. W. D. H.

Coefficients of Digestibility and Availability of Foods. Wilbur O. Atwater (*Proc. Amer. Physiol. Soc.*, 1903, xxx—xxxi; *Amer. J. Physiol.*, 10).—The coefficient of digestibility would be found by subtracting the undigested residue from the food; the coefficient of availability is found by subtracting the total excreta from the total food. Some hundreds of experiments on man have enabled data of such coefficients to be recorded, and the average shows the coefficient of availability for proteid to be 91·1, for fat 94·8, and for carbohydrate 96·8 per cent. In vegetable diet, the availability of the proteid is less. W. D. H.

Solubility in Gastric Juice of the Nitrogenous Constituents of Sheep's Fæces. Carl Beger (*Zeit. physiol. Chem.*, 1903, 40, 176—181).—Comparing the fresh with the dried material, the amount of the nitrogenous substances indigestible by pepsin-hydrochloric acid is lower in the former. The solubility of the proteid is 6·3 per cent. greater in the fresh material. Differences on different kinds of diet are given. W. D. H.

Peptic and Tryptic Digestion of Proteids. D. Lawroff (*Zeit. physiol. Chem.*, 1903, 40, 165—166).—Polemical against Salaskin and Kowalewsky (Abstr., 1903, ii, 559). In 1871, Lubavin described the occurrence of leucine and tyrosine among the products of the peptic digestion of casein. In 1901, the author showed that after 2 months' peptic digestion with commercial pepsin, or the natural gastric juice, the products obtained from casein and gelatin contained substances not precipitable by phosphotungstic acid. W. D. H.

Inversion of Sucrose in the Stomach. GRAHAM LUSK (*Proc. Amer. Physiol. Soc.*, 1903, xxi—xxii; *Amer. J. Physiol.*, 10).—Further experiments are given which uphold the author's previous conclusion that the inversion of sucrose which occurs in the stomach is entirely due to the acid. No evidence of an enzyme was found. W. D. H.

Acid Formation in the Stomach. LEO SCHWARZ (*Beitr. chem. Physiol. Path.*, 1903, 5, 56—68).—The secretion of acid in the stomach is accompanied by a decrease in the acidity of the urine due to the increase of carbonate there. In chlorine hunger in dogs, the administration of sodium chloride or bromide (but not iodide) stimulates the gastric mucous membrane, and at the same time the effect of increased carbonates is seen in the urine. In normal animals, these salts do not produce this effect. W. D. H.

Plasteinogen. H. BAYER (*Beitr. chem. Physiol. Path.*, 1903, 4, 554—562).—Plastein is the name given by Sawjaloff (Abstr., 1901, ii, 403) to the precipitate formed on the addition of rennin to albumose solutions. Its parent substance may be named plasteinogen; this is neither proto- nor hetero-albumose, but a later product of digestion; the non-proteid products which occur last in the proteolytic process yield no plastein. Plasteinogen is soluble in 80 per cent. alcohol and acetone; it is a proteid of simple composition containing the tyrosine, cystin, and probably also the carbohydrate and indole nuclei. Analysis of plastein does not confirm the hypothesis that this substance is regenerated proteid. W. D. H.

Nutritive Value of Alcohol. RUDOLF ROSEMANN (*Pflüger's Archiv*, 1903, 100, 348—366. Compare Abstr., 1901, ii, 668).—A further contribution to a much discussed question, which upholds the author's previously expressed view that alcohol within certain limits is of nutritional value. W. D. H.

Formation of Sugar from Leucine. JOHN T. HALSEY (*Amer. J. Physiol.*, 1904, 10, 229—235).—Although the possibility that the leucine complex as it exists in proteid may be concerned in sugar formation still remains, the experiments recorded led the authors to believe that pure leucine administered to phloridzinised dogs is not changed into sugar. W. D. H.

Coagulative Action of Autolytic Organ Extracts on Milk and on Albumose Solutions. A. NÜRNBERG (*Beitr. chem. Physiol. Path.*, 1903, 4, 543—553).—Extracts of organs subjected to aseptic autolysis have a coagulative action on solutions of albumose; the liver gives the most marked result; then follow in order stomach, lung, pancreas, intestine, kidney, brain, and muscle. With regard to milk, the order is different; here the pancreas comes first, especially with fresh extracts; these are even more rapid in their rennet-like action than fresh extracts of the stomach. On albumose solutions, stomach extracts act best if faintly acid; the influence of reaction is not so marked in the case of

other organs, but there are individual differences; the best results were obtained with organs from the pig, after 16 hours' autolysis.
W. D. H.

End-products of Auto-digestion of Animal Glands. PHOEBUS A. LEVENE (*Proc. Amer. Physiol. Soc.*, 1903, xxxviii; *Amer. J. Physiol.*, 10).—The communication relates only to the amino-acids obtained on the auto-digestion of liver and pancreas, the former in 0·2 per cent. solution of acetic acid, the latter in 0·5 per cent. solution of sodium carbonate. Alanine, aminovaleric acid, leucine, glutamic and aspartic acids, tyrosine, and phenylalanine were identified. The presence of pyrrolidine-2-carboxylic acid could not be established with certainty.
W. D. H.

End-products of Tryptic Digestion of Gelatin. PHOEBUS A. LEVENE (*Proc. Amer. Physiol. Soc.*, 1903, xxxix; *Amer. J. Physiol.*, 10).—Gelatose contains more glycine than gelatin; gelatin peptone contains less than gelatose. The crystalline products of digestion were therefore studied. Those found were glycine in very large quantities, leucine, glutamic acid, in smaller quantities, phenylalanine, and a substance having the composition of inactive pyrrolidinecarboxylic acid; the copper salt which was analysed differs in appearance from that of the 2-acid.
W. D. H.

The Liver. LUDOLPH BRAUER (*Zeit. physiol. Chem.*, 1903, 40, 182—214).—Methylene-blue, which is employed therapeutically for cholescystitic affections, is excreted by the bile in much larger amount than by the urine. In normal bile, and in the bile of alimentary glycosuria, and of phloridzin diabetes, sugar is absent in the bile or only traces occur. In pancreatic diabetes, the bile contains 0·8 per cent. or less of sugar. Ethyl and amyl alcohols pass easily into the bile and produce irritation of the liver parenchyma; the bile in these circumstances is usually albuminous. There is also irritation of the epithelium of the bile ducts, and appearances similar to urinary casts are seen in the bile.
W. D. H.

An Oxidising and Reducing Ferment in the Liver. J. E. ABELOUS and JULES ALOY (*Compt. rend.*, 1903, 137, 885—887).—From experiments conducted with aqueous extracts of horses' liver and alkaline nitrates and salicylic acid, the conclusion is drawn that the ferment which produces reduction in one case, and oxidation in the other, is one and the same substance.
W. D. H.

The Sugar-forming Ferment of the Liver. L. BORCHARDT (*Pflüger's Archiv*, 1903, 100, 259—297).—The sugar obtained from the liver after death is sometimes almost exclusively dextrose, at other times this is mixed with maltose and *iso*maltose. Like the similar ferment in the blood, the action of the liver ferment on glycogen leads to the formation of dextrins as intermediate products. Achroodextrin is readily obtained. The same ferment action can be obtained with liver previously coagulated by alcohol. The results are mainly confirmatory of those previously described by Bial, Shore, Pavy, Tebb, and others. W. D. H.

Autolysis. Julius Arnheim (*Zeit. physiol. Chem.*, 1903, 40, 234—239).—The addition of gelatin to a liver allowed to digest itself increases the formation of peptone and amino-acids. Carbohydrates also further the action. Certain neutral salts investigated have no effect. W. D. H.

Glycolysis. Julius Arnheim and Adolf Rosenbaum (*Zeit. physiol. Chem.*, 1903, 40, 220—233).—All the tissues investigated have a glycolytic action; the addition of pancreas to other tissues increases this action. W. D. H.

Absorption of Iron in the Rabbit. S. Tartakowsky (*Pflüger's Archiv*, 1903, 100, 586—610).—This is a microchemical study, and the conclusion is reached that iron given as a drug is absorbed in the same way and accumulates in the same organs as the ordinary iron of the nutriment. W. D. H.

The Passage of Different Foods from the Stomach. W. B. Cannon (*Proc. Amer. Physiol. Soc.*, 1903, xvii—xviii; *Amer. J. Physiol.*, 10).—Röntgen ray shadows cast by various foods mixed with bismuth subnitrate afford a method of estimating the relative amount of food in the intestines. In the cat, the discharge of proteids from the stomach is delayed as compared with carbohydrate; this is due to the absence of free acid at first, but if the proteid be rendered acid beforehand, and the carbohydrate alkaline this is reversed. Acid in the stomach is the stimulus for the opening of the pyloric orifice, and in the intestine for its closure. W. D. H.

Influence of Tannin and Morphine on the Absorption of Sodium Chloride in the Small Intestine. Biberfeld (*Pflüger's Archiv*, 1903, 100, 252—258).—Tannin of 1 per cent. concentration reduces absorption from within an intestinal loop to one-third; with 0·1 per cent. concentration it is hastened, whilst with a concentration of 0·04 per cent. there is no effect. Morphine given as 0·1 per cent. solution of aqueous extract of opium, or as small doses of the hydrochloride, hastens absorption markedly. W. D. H.

Influence of Castration. Robert Breuer and Rudolf (Freiherr) von Seiller (*Chem. Centr.*, 1903, ii, 1340; from *Arch. exp. Path. Pharm.*, 50, 169—198. Hugo Lüthji, *ibid.*, 1341, from *ibid.*, 268—272).—Castration in young female dogs has no ill effects; the body-weight is maintained, but the hæmoglobin and red corpuscles of the blood diminish in parallel lines. In either sex, the operation has no influence on the metabolism of proteid, fat, phosphoric acid, or calcium. W. D. H.

Osmotic Properties of Muscle. W. M. Fletcher (*J. Physiol.*, 1904, 30, 414—438).—A detailed account of work previously abstracted (Abstr., 1903, ii, 90). W. D. H.

Effects of Salts on the Tonicity of Skeletal Muscle. WILLIAM D. ZOETHOUT (*Amer. J. Physiol.*, 1904, 10, 211—221).—The salts of potassium, cæsium, ammonium, and rubidium increase the tonicity of skeletal muscles. The iodide, bromide, and sulphate have a greater effect than the chloride. The chlorides of sodium, lithium, and especially calcium, strontium, and magnesium abolish this effect. Certain salts (iodide, bromide, sulphate) of sodium may increase the tone, but this action is slight compared with their power to cause rhythmical action; the action of lithium salts is still less. Barium chloride antagonises the action of potassium chloride in preventing tonicity, and potassium chloride antagonises the action of barium chloride in preventing rhythmical action. W. D. H.

Effects of Ringer's Fluid on Plain Muscle. RAGHAVENDRA ROW (*J. Physiol.*, 1904, 30, 461—475. Compare Abstr., 1903, ii, 498).—The influence of Ringer's fluid on the plain muscle of the frog's stomach is to maintain its irritability, and keep up rhythmical action for hours, acting, in fact, as it does on the heart. The presence or absence of potassium chloride on the fluid is immaterial. Sodium chloride alone leads to gradual diminution and abolition of the movements; here again is a resemblance to heart muscle. An initial augmentation seen in plain muscle with this salt is, however, absent in the case of the heart. Calcium chloride acts on plain exactly as it does on skeletal muscle. W. D. H.

Production of Contact Irritability without the Precipitation of Calcium Salts. WILLIAM D. ZOETHOUT (*Amer. J. Physiol.*, 1904, 10, 324—334).—The chlorides of potassium, cæsium, ammonium, rubidium, and perhaps barium aid the development of, although they do not produce, contact irritability. The chlorides of sodium, lithium, magnesium, and calcium inhibit it. In the normal muscle, only those salts of sodium that precipitate calcium can produce it, but if cæsium or rubidium chloride is introduced into the muscle simultaneously with the acetate, succinate, or nitrate of sodium, contact irritability is established. W. D. H.

Biochemical Synthesis. SAMUEL B. SCHRYVER (*Proc. Physiol. Soc.*, 1904, xliv—xlviii; *J. Physiol.*, 30).—Aldehydes act on ethyl malonate, producing a series of condensation products (Claissen and Komnenos). Knoevenagel showed that this will occur even at low temperatures in the presence of piperidine and other bases acting catalytically. The present paper seeks an answer to the question whether such a reaction plays any part in the carbohydrate metabolism in the body, but with all the experiments recorded with bases from the organs, negative results were obtained.

W. D. H.

Albumins from the White of Rooks' Eggs. WLADIMIR W. WORMS (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 835—844).—The white of rooks' (*Corvus frugilegus*) eggs contains two white substances: (1) one insoluble in semi-saturated ammonium sulphate solution; and (2) the other, present in larger quantity, readily soluble in this solution. The latter consists of three albumins, named by the author *corvin*, *corvinin*, and *corvinidin*, possessing different compositions.

T. H. P.

Rôle of Leucocytes in Fibrin Formation. E. Maurel (*Compt. rend. Soc. Biol.*, 1903, 55, 1492—1494).—Observations which lead the author to doubt whether the leucocytes have anything to do with the formation of fibrin. W. D. H.

Enzyme of the Thymus and Suprarenal. Walter Jones (*Proc. Amer. Physiol. Soc.*, 1903, xxiv—xxv; *Amer. J. Physiol.*, 10).—Autodigestion of the thymus and of the nucleo-proteid of the thymus led to the formation of phosphoric acid and xanthine bases, of which xanthine itself and hypoxanthine were separated. The hydrolytic products of thymonucleic acid are adenine and guanine. The same results were obtained with the suprarenal. W. D. H.

Mineral Constituents of Cow's Milk and their Variations in the Course of a Lactation Period. August Trunz (*Zeit. physiol. Chem.*, 1903, 40, 263—310. Compare Abstr., 1903, ii, 742).—A continuation of the author's work, in which numerous analyses of the inorganic constituents are presented in tabular form. W. D. H.

Local Application of Saline Purgatives to the Peritoneal Surface of the Intestine. John B. MacCallum (*Amer. J. Physiol.*, 1904, 10, 259—268. Compare Abstr., 1903, ii, 742).—Small quantities of saline purgatives (barium chloride, sodium citrate, and sulphate) applied to the peritoneal surface of the intestine produce increased peristalsis. This may be inhibited by the local application of calcium or magnesium chloride. The purgatives in question cause increased secretion whether given subcutaneously, intravenously, or applied locally; this can be inhibited in the same way.

W. D. H.

The Physical Factors in Urine Formation. Torald Sollmann and R. A. Hatcher (*Proc. Amer. Physiol. Soc.*, 1903, xxv—xxvii; *Amer. J. Physiol.*, 10).—In an excised and perfused kidney, the amount of chloride in the perfusing fluid and the ureter filtrate is the same. The kidney volume and the flow from vein and ureter run parallel to the injection pressure. Compression of the vein stops the ureter flow. Numerous other circumstances, including the admixture of various drugs, &c., to the perfusing fluid cause variations which are described. W. D. H.

Effect of Diuretics with a Diet Poor in Salts. H. D. Haskins (*Amer. J. Physiol.*, 1904, 10, 362—363).—Sollmann showed that in rabbits diuretics with a diet poor in salts produce an increase of urinary chlorides, but this is not the case in dogs, whose kidneys are more resistant. The present experiments show that the human kidney belongs to the resistant class. W. D. H.

Elimination of Sugar and Compounds of Glycuronic Acid under the Influence of Traumatism, and Injections of Sugar into the Blood. Cadéac and Maignon (*Compt. rend. Soc. Biol.*, 1903, 55, 1464—1466. Compare Abstr., 1903, ii, 310, 675).—Traumatism leads to an elimination in the urine of glycuronic acid and often of sugar. The sugar originates in the injured tissues. Injection of sugar into the blood stream insufficient in amount to cause glycosuria leads to the appearance of glycuronic acid in the urine; if this limit is exceeded, sugar appears as well. W. D. H.

The Nitrogen Excretion in a Case of Phosphorus Poisoning. Rudolf von Jaksch (*Zeit. physiol. Chem.*, 1903, 40, 123—147).—In the case recorded, the products of nitrogenous metabolism (ammonia, uric acid, amino-acids, and especially urea) were increased in the urine. The urea estimations were made by the Schöndorff and Mörner-Sjoqvist methods, which gave closely accordant results. W. D. H.

Urea of Human Urine. Wm. Ovid Moor (*Zeit. physiol. Chem.*, 1903, 40, 162—164. Compare Abstr., 1903, ii, 343).—Polemical against Erben (Abstr., 1903, ii, 581). The author maintains that the urea of the urine amounts to only one-half or even less of what is usually stated to be the case.

William J. Gies (*J. Amer. Chem. Soc.*, 1903, 25, 1295) holds that the substance Moor isolated from urine and termed *ureine* is a mere mixture of different organic and (mainly) inorganic constituents of urine. W. D. H.

Influence of Diet on Uric Acid Excretion. Paul Pfeil (*Zeit. physiol. Chem.*, 1903, 40, 1—24).—With diet free from meat in healthy men, the excretion curve of uric acid shows individual differences, but is nearly a straight line with a slight rise in the morning. If the diet is completely free from nitrogen, the same values are obtained. With a mixed diet containing abundance of meat (320 to 350 grams per diem), there is a great rise which reaches its summit four hours after the meat is taken; the actual amount excreted shows individual differences. W. D. H.

Influence of Diet on Uric Acid Excretion in Uric Acid Arthritis. Franz Soetbeer (*Zeit. physiol. Chem.*, 1903, 40, 25—54). **Metabolism in Gout.** Franz Soetbeer (*ibid.*, 55—61. Compare Abstr., 1902, ii, 417).—In five patients, the uric acid in the urine was estimated at three hour intervals; on a diet free from meat, there are only small differences from the normal curve (see preceding abstract); the morning rise is generally absent, but unexpected sudden rises occur during the day. On a mixed diet with excess of meat, in acute gout the large rise in the curve is absent. In chronic gout also, where the kidneys are normal, irregularities in the curve are noted, and in one case the rise after intake of meat was completely absent.

In a case of gout, between the attacks, on a mixed diet, there was in two days an excretion of potassium less by 3·5 grams than in normal persons. The excretion of ammonia and of uric acid was very low, but the acidity of the urine was increased. W. D. H.

Increase of Uric Acid Excretion in Cats after Administration of that Substance by the Mouth. ARTHUR KANGER (*Pflüger's Archiv*, 1903, **100**, 428—441).—There is an increase in the uric acid excreted in the urine of the cat after that substance is given by the mouth. The quantity excreted is, however, much less than that given. Hopkins' method of estimation was used. W. D. H.

Acid Dyscrasia. ALEXANDRE DESGREZ and J. ADLER (*Compt. rend.*, 1903, **137**, 818—819).—The subcutaneous injection of dilute solutions of hydrochloric acid in guinea pigs lessens the amount of hippuric acid excreted by nearly one-half, owing to impairment of the synthetic power of the living cells. W. D. H.

The Fate of Cystin in the Body. L. BLUM (*Beitr. chem. Physiol. Path.*, 1903, **5**, 1—14).—Cystinuria is due to an abnormal form of proteid metabolism; it does not occur when cystin is given by the mouth. When cystin is injected intravenously, it is only in part utilisable, the rest leaving by the urine. Experiments, in which the injection was made into a mesenteric vein, and others in which the minced liver was employed, indicate the liver as the main seat of the decomposition into urea which occurs. The kidneys and blood play no part in this. Further details are promised regarding the organic sulphur compounds which originate from cystin. W. D. H.

Nature of Urinary Indican. LOUIS MAILLARD (*Compt. rend. Soc. Biol.*, 1903, **55**, 1332—1334, 1334—1335).—Polemical against Monfet (this vol., ii, 63, 102). W. D. H.

Precursors of Urinary Indican. FRANK P. UNDERHILL (*Proc. Amer. Physiol. Soc.*, 1903, xxvii; *Amer. J. Physiol.*, **10**).—Indole from intestinal putrefaction is doubtless the main precursor of indican in the urine. Tryptophan may be a precursor of indole. Tryptophan is scatole-aminoacetic acid, and the Adamkiewicz reaction of proteids is due to tryptophan (Hopkins and Cole). Among proteids, some (notably gelatin) fail to give the test. Feeding with gelatin as the sole nitrogenous article in the diet, causes a marked decrease of urinary indican. W. D. H.

Indoxyluria. FRITZ ROSENFELD (*Beitr. chem. Physiol. Path.*, 1903, **5**, 82—94, and *Chem. Centr.*, 1903, ii, 1464; from *Verh. Vers. Deut. Naturf. Aerzte*, 1902, ii, 61—64).—In rabbits receiving a small but adequate amount of suitable food, no indoxyl appears in the urine; if this is diminished, indoxyl appears. The same result follows injection of phloridzin. Here indoxyl does not originate from intestinal putrefaction, but from the breakdown of tissues. Tryptophan appears to be an intermediate substance in its formation.

W. D. H.

Ehrlich's Diazo-reaction. Louis Maillard (*Compt. rend. Soc. Biol.*, 1903, 55, 1419—1421, 1421—1423).—Monfet (this vol., ii, 63) attributes this reaction to urinary indican, and in confirmation states that the reaction is given by certain indigo-yielding plants. The plant reactions described are spoken of as "banal," but, such as they are, are produced by the yellow pigments of the leaves which belong to the tannin group. Conjugated indoxyl as it occurs in urine plays no part in the reaction. W. D. H.

Neutral Sulphur and Ehrlich's Diazo-reaction. L. Monfet (*Compt. rend. Soc. Biol.*, 1903, 55, 1503—1505 ; Louis Maillard, *ibid.*, 1508—1509).—The diazo-reaction is still regarded by the first author, in spite of criticisms, as due to excess of conjugated aromatic sulphates. He admits that many of his conclusions have been hasty. On a flesh diet, and during diarrhœa, the reaction is intense ; after a saline purge or vegetable diet, it lessens. The second paper contains more criticisms. W. D. H.

Ether Anæsthesia. Philip B. Hawk (*Proc. Amer. Physiol. Soc.*, 1903, xxxvii—xxxviii ; *Amer. J. Physiol.*, 10).—In ether anæsthesia, the urinary flow is diminished ; afterwards there is slight diuresis with a small rise in total nitrogen and a large rise in chlorine excretion. Glycosuria always occurs unless the animal (dog) is fasting. There is an increase in both the red and white blood corpuscles. W. D. H.

The Relation of Blood Pressure and Pulse Pressure to Urinary Secretion in a Case of Physiological Albuminuria. Joseph Erlanger and Donald R. Hooker (*Proc. Amer. Physiol. Soc.*, 1903, xvi ; *Amer. J. Physiol.*, 10).—Posture, and hence pulse pressure, influences the composition of urine. The amounts of chlorides (especially) of total nitrogen and phosphates is increased by the recumbent position. In a case of so-called "physiological albuminuria," an increase of pulse pressure (measured by a new sphygmomanometer) accompanied an increase in the amount of urine, and a decrease in the albumin. W. D. H.

Variations in the Permeability of the Kidney for Sodium Chloride in the Course of Bright's Disease. Widal and Adolphe Javal (*Compt. rend. Soc. Biol.*, 1903, 55, 1532—1535, 1639—1642).—In Bright's disease, the impermeability of the kidney for sodium chloride (which is believed by the authors to be the main cause of albuminuria and œdema) is never absolute, but varies a good deal in the course of the malady, as is shown by the observations recorded. No such impermeability exists for urea. W. D. H.

The Urine in Beri-Beri. Herbert E. Durham (*Brit. Med. J.*, 1904, i, 480—482).—Metabolism in this disease is much diminished. Urea, phosphoric acid, and sulphuric acid are much reduced in the urine. It should, however, be noted that Tamils, even on liberal diet, excrete less of these substances than Europeans, although their uric acid output is high. In beri-beri, the purine substances show nothing of interest, and the conjugated sulphuric acid and neutral sulphur are not proportionately diminished. W. D. H.

Lævulose Diabetes. WILHELM SCHLESINGER (*Chem. Centr.*, 1903, ii, 1464—1465; from *Arch. exp. Path. Pharm.*, 50, 273—293).—In a case of rickets in a girl, lævulose free from dextrose appeared in the urine. On a mixed diet, 1·5 grams were excreted daily; on cessation of food, it disappeared. Starch and dextrose had no effect. If lævulose was given, 12·5 per cent. of it was excreted unchanged. One hundred grams of sucrose were given, and 11 of lævulose excreted. Inulin had no effect. Phloridzin injection led to the appearance of dextrose instead. Lævulose was looked for in 15 other cases of diabetes with negative result. In two cases, there was excretion of sucrose after abundant carbohydrate food. W. D. H.

Tuberculins. BÉRANECK (*Compt. rend.*, 1903, 137, 889—891).—The toxins produced in tuberculosis are numerous, and vary with the reaction of the medium in which the bacillus is grown. In the course of a cultivation, neutral and alkaline media become acid. The different toxins produce different symptoms, and in their therapeutic action it is necessary to take this fact into account. W. D. H.

Intravenous Injection of Sodium Hydrogen Carbonate after Severe Hæmorrhage. PERCY M. DAWSON (*Proc. Amer. Physiol. Soc.*, 1903, xxxv—xxxvi; *Amer. J. Physiol.*, 10).—Sodium hydrogen carbonate injection restores cardiac action better than solutions of sodium chloride. The beneficial action persists longer with a mixture of 0·8 per cent. of sodium hydrogen carbonate and 0·25 per cent. of sodium chloride. W. D. H.

Action of Bismuth. GOTTHOLD FUCHS (*Chem. Centr.*, 1903, ii, 1464; from *Verh. Vers. Deut. Naturf. Aerzte*, 1902, ii, 90—94).—The secretion of mucus is no mere mechanical effect of bismuth crystals, but specific. The beneficial action of bismuth salts is due to reduction to a lower oxide which passes into the granulation tissue. Bismuthose, a compound with proteid, is specially recommended. W. D. H.

Intravascular Injection of Salts and Nucleo-proteid. J. A. MACWILLIAM, A. H. MACKIE, and CHARLES MURRAY (*J. Physiol.*, 1904, 30, 381—399).—Small amounts of sodium carbonate and magnesium sulphate induce disturbances of respiration and circulation, and so should not be used as anti-coagulants in blood-pressure work. Sodium sulphate is a better salt to use for such purposes, and best of all are sodium citrate (1 per cent.) and sodium oxalate (0·2 per cent.), which produces no disturbance. A 1 per cent. solution of sodium carbonate is usually employed to dissolve nucleo-proteid in experiments on intravascular coagulation; this solution alone, however, often causes arrest of respiration and muscular twitchings. The exophthalmus that occurs in fatal injections of nucleo-proteid is due to hæmorrhage in the orbit.

Nucleo-proteid causes no coagulation in blood shut up in an artery or vein. It is apparently in the capillary area that the conditions for this result are present.

When the circulation is shut off from the lower half of the body (below the diaphragm), nucleo-proteid injection readily causes coagulation. The "negative phase" is not seen in these circumstances or in the blood shut up within a large vessel. This phase is possibly due to the genesis of anti-substances in the abdominal viscera.

W. D. H.

The Fate of Monoamino-acids in the Body after Intravascular Injection. KARL STOLTE (*Beitr. chem. Physiol. Path.*, 1903, 5, 15—26).—Some of the amino-acids (tyrosine and phenylalanine) cannot with certainty be found to increase the urea in the urine after intravenous injection in rabbits. Others (alanine, aspartic acid, glutamic acid, cystin) increase the urea nitrogen and also that of the monoamino-acid fraction. In other cases, again, they are so quickly broken up that there is only an increase of urea. Leucine and glycine belong to the last group. W. D. H.

Immunisation of Rabbits against the Hæmolytic Action of Sodium Taurocholate. E. RIST and L. RIBADEAU-DUMAS (*Compt. rend. Soc. Biol.*, 1903, 55, 1519—1521, 1521—1522).—By the gradual immunisation of the rabbit with the bile salt, the resistance of its red corpuscles towards the hæmolytic action of that reagent is increased. There is also increased activity of the blood-forming tissues. W. D. H.

Physiological Action of Cyclic *iso*Oximes, Ketones, Imines, and Oximines of the Hydroaromatic Series. CARL JACOBJ, HARNO HAYASTIE, and SZUBINSKI (*Chem. Centr.*, 1903, ii, 1343, from *Arch. exp. Path. Pharm.*, 50, 199—246).—The following were the substances investigated: cyclic ketones (pentanone, hexanone, camphor, &c.), cyclic imines (piperidine, &c.), cyclic *iso*oximes (oxypiperidine, &c.), alkyl substitution products of cyclic *iso*oximes, and cyclic oximes. The main symptoms are convulsions, central paralysis, and effects on motor nerve-endings. W. D. H.

Actions of Adrenaline [Epinephrine]. MAURICE LOEPER (*Compt. rend. Soc. Biol.*, 1903, 55, 1452—1453, 1453—1455).—Adrenaline produces hæmolysis, stimulates the activity of tissues where new blood corpuscles are formed, after a time leads to atheroma, and punctiform hæmorrhages in the suprarenal gland. Bad effects are avoided if the substance is injected subcutaneously. W. D. H.

Effect of Adrenaline [Epinephrine] on Pulmonary and other Vessels. T. GREGOR BRODIE and WALTER E. DIXON (*J. Physiol.*, 1904, 30, 476—502).—The rate of flow perfused at constant pressure through the vessels was used to determine the calibre of the arterioles. Stimulation of vaso-constrictor nerves of limbs or intestines gives a positive result more than two hours after death. Adrenaline, pilocarpine, muscarine, and barium chloride all cause constriction. No evidence was found of any vaso-motor supply to the pulmonary arterioles. Here, of the drugs mentioned, barium chloride alone causes constriction; the others act as dilators; the systemic vessels behave like the pulmonary when constrictor nerve-endings are paralysed by apocodeine or curare. The general conclusion drawn is that barium chloride acts on muscle fibres, whilst the other three substances cause constriction by acting on nerve-endings.

W. D. H.

Relation between Solution Tension, Atomic Volume, and Physiological Action of the Elements. ALBERT P. MATHEWS (*Amer. J. Physiol.*, 1904, 10, 290—323).—The poisonous action of salts as tested on *Fundulus* eggs varies inversely with the sum of the solution tensions of both ions, that is, with the decomposition tension of the salt. There is an inverse relationship between atomic volume and poisonous action. Numerous exceptions to these rules are noted.

W. D. H.

Toxicity of Tetraphosphorus Trisulphide. A. E. THAYER and CHARLES G. L. WOLF (*J. Medical Research, Boston, U.S.A*, 1903, 9, 191—216).—Tetraphosphorus trisulphide (P_4S_3), a substance largely employed in various manufactures, may be regarded as non-toxic in ordinary circumstances. Air which has been passed through it has no effect on rabbits. Given by the mouth in dogs, it acts as a mild local irritant of the small intestine, and to a less degree of the stomach. After prolonged treatment with small doses, or shorter treatment with large doses, it acts destructively on white blood corpuscles and the epithelial cells of renal cortex, liver, pancreas, and cardiac muscle in the order named; but the effect is not marked, and recovery is rapid on cessation of administering the material. Hæmolysis, jaundice, and the appearance of albumin, sugar, leucine, and tyrosine in the urine were never observed. W. D. H.

Action of Radium on Simple Animals. E. G. WILLCOCK (*J. Physiol.*, 1904, 30, 449—454).—The lethal action of radium emanations varies with different species of animals. *Hydra viridis*, *Opalina*, and others show no sign of injury after 24 hours' exposure, whilst *Hydra fusca* and *Actinosphaerium* begin to disintegrate in a few hours. W. D. H.

Toxicity of Hydroxyl Derivatives of Benzene. ALLYRE CHASSEVANT and CHARLES GARNIER (*Compt. rend. Soc. Biol.*, 1903, 55, 1584—1586).—Experiments were conducted with benzene, the monosubstitution derivative, phenol, disubstitution derivatives (catechol, resorcin, quinol), and the trisubstitution products (pyrogallol and phloroglucinol). The effects produced are convulsions and hypothermia; the toxicity increases in the order named, except in the case of the trisubstitution derivatives, the toxicity of which is only a little greater than that of benzene itself. W. D. H.

Antagonism between Alkaloids and Salts. Martin H. Fischer (*Amer. J. Physiol.*, 1904, 10, 345—351).—The experiments were limited to strychnine and the chlorides of calcium, barium, and magnesium, and sodium citrate. No antagonising action on animals was observable.
W. D. H.

Minimal Fatal Doses of Sparteine Sulphate. E. Maurel (*Compt. rend. Soc. Biol.*, 1903, 55, 1339—1342).—The minimal lethal dose of sparteine sulphate is, per kilo. of body-weight, 0·15 gram for the conger and frog, 0·10 gram for the pigeon and rabbit.
W. D. H.

Toxicity of Sparteine Sulphate. E. Maurel (*Compt. rend. Soc. Biol.*, 1903, 55, 1427—1428).—Sparteine sulphate is not a cardiac poison. It kills by arrest of the respiration, due to its action both on nerves and muscles. The favourable action of therapeutic doses in the circulation is due to its action on the peripheral vessels, not on the heart.
W. D. H.

Ricin. T. B. Osborne and Lafayette B. Mendel (*Proc. Amer. Physiol. Soc.*, 1903, xxxvi—xxxvii; *Amer. J. Physiol.*, 10).—The proteids of the castor oil bean are an albumin, a globulin, and a proteose. The two latter are the most abundant, and are not toxic. The toxicity of the purified albumin is very great, 0·002 mg. per kilo. of body-weight being sufficient to kill a rabbit when injected subcutaneously; this is much more poisonous than Cushny's preparation. Cushny's results are in the main confirmed; there is little ground for believing that ricin is a non-proteid substance.
W. D. H.

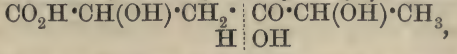
Chemistry of Vegetable Physiology and Agriculture.

Physiology of Bacillus Prodigiosus. S. Samkow (*Centr. Bakt. Par.*, 1903, ii, 305—311).—The appearance of the red pigment during the growth of *Bacillus prodigiosus* is conditioned by the presence of magnesium salts in the nutrient material, although there is no magnesium in the pigment itself.
A. McK.

Buckwheat in presence of a Mixture of Algæ and Bacteria. Raoul Bouilhac and Ercole Giustiniani (*Compt. rend.*, 1903, 1274—1276).—Sand cultures (2·5 kilos. of sand) of *Nostoc punctiforme* and *Anavoena*, with bacteria, gained 37 mg. of nitrogen in six weeks, the gain in sand alone, attributed to rain, being only 4 mg. of nitrogen.

Experiments were also made in which buckwheat was grown in pots containing sand (10 kilos.) free from organic matter. One pot remained without inoculation, whilst two received small quantities of algæ and a few drops of soil extract. The algæ and bacteria enabled the buckwheat to grow normally; in absence of algæ, the growth was very restricted. N. H. J. M.

The Chemical Reactions Occurring during Alcoholic Fermentation. EDUARD BUCHNER and JAKOB MEISENHEIMER (*Ber.*, 1904, 37, 417—428).—A number of experiments have been made to determine the amounts of lactic acid in (*a*) fresh yeast extract, (*b*) the same extract when kept for several days, (*c*) the same extract after addition of sucrose and keeping, and (*d*) the same extract after addition of *i*-lactic acid. Although all the results do not agree, it is concluded that *a*-lactic acid plays an important part in alcoholic fermentation, and is probably an intermediate product of the decomposition. A modification of Baeyer's hypothesis (*Ber.*, 1870, 3, 73) is suggested; the first process is regarded as a hydrolysis similar to the ketonic hydrolysis of ethyl acetoacetate, whereby a dihydroxy-γ-ketonic acid,



$$\mathrm{CO_2H{\cdot}CH(OH){\cdot}CH_2{\cdot}}\underset{\mathrm{H}\,\vdots\,\mathrm{OH}}{\vdots}\mathrm{CO{\cdot}CH(OH){\cdot}CH_3},$$

is formed, and this, on further hydrolysis, yields *a*-lactic acid.

The differences in the results obtained with different yeast extracts; in the one case, an increase, and in the other a diminution in the amount of lactic acid present after keeping, is explicable if it is assumed that two enzymes are concerned, one of which transforms the dextrose into lactic acid and the other decomposes the lactic acid into alcohol and carbon dioxide.

Acetic acid is also formed during alcoholic fermentation with yeast cell extract.

All extracts used were previously mixed with 1 per cent. of toluene. J. J. S.

Plants containing, in their Seeds, an Enzyme which Decomposes Fats into Glycerol and Fatty Acids. SERGIUS FOKIN (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 831—835).—The author has examined the seeds of several plants for the presence of an enzyme capable of decomposing fats into glycerol and fatty acids. The seeds of *Chelidonium majus* are especially active in this respect, more so, indeed, than those of the castor oil plant. The enzyme was also detected, although in less quantity, in the seeds of *Taraxacum vulgare*, *Brunella vulgaris*, *Cynoglossum*, *Aquilegia vulgaris*, and *Aconitum Lycoctonum*. T. H. P.

Rôle of Calcium Oxalate in the Nutrition of Plants. AMAR (*Compt. rend.*, 1903, 137, 1301—1303).—The results of experiments with different plants indicated that calcium (supplied in the form of nitrate) is entirely assimilated up to a certain point, which varies according to the species of plant, and that any excess is eliminated as oxalate. The conclusion is drawn that calcium oxalate is formed to eliminate calcium and not, as supposed by Böhm, Schimper, and Groom, to eliminate oxalic acid. N. H. J. M.

Development of Annual Fatty Plants; Study of the Mineral Bases. Gustav André (*Compt. rend.*, 1903, **137**, 1272—1274).—The amounts of water, calcium, and potassium were determined at successive periods of growth in *Sedum azureum*, *Mesembrianthemum tricolor*, and *M. crystallinum*. Whilst in *Sedum* there is an excess of calcium over potassium, the two *Mesembrianthemums* (especially *M. crystallinum*) contain a very large excess of potassium over calcium. The character of the fatty plant—the feeble transpiration and the low respiration—is not affected by the excess of potassium over calcium or the reverse.

N. H. J. M.

Acid of the Moss Berry. I. Aparin (*J. Russ. Phys. Chem. Soc.*, 1903, **35**, 811—815).—The acid contained in the moss berry (*Vaccinium oxycoccus L.*) was stated by Scheele (*Crell's Chem. Ann.*, 1785, **10**, 291) to be citric acid, whilst according to Stolle (Abstr., 1900, ii, 614) it is glyoxylic acid. The author finds that the only acid present in the moss berry is citric acid, the aldehydic properties of the acid obtained by Stolle being probably due to admixed dextrose.

T. H. P.

Relation between the Amounts of Gluten and Total Nitrogen in Different Wheats. Émile Fleurent (*Compt. rend.*, 1903, **137**, 1313—1315).—The results of analyses of seventeen varieties of wheat show that the relation of gluten to total nitrogenous matter frequently varies. Wheats which contain the same amounts of total nitrogen may show variations in gluten of 1·3 to 1·82 per cent., and wheats containing the same amounts of gluten may vary, as regards the amount of total nitrogenous matter, by 0·4 to 3·26 per cent. The variation is chiefly due to differences in the relation of envelopes and germs in the different varieties. Richness in gluten is not incompatible with the yield and is mainly a question of variety.

Determination of total nitrogen is insufficient and should be replaced by determination of gluten, on which the value of the mill-products depends. N. H. J. M.

Composition of Different Parts of the Maize Kernel. Cyril G. Hopkins, L. H. Smith, and E. M. East (*J. Amer. Chem. Soc.*, 1903, **25**, 1166—1179. Compare Abstr., 1899, ii, 687).—The amounts of proteids, carbohydrates, oil, and ash were determined in the separated portions (tip caps, hulls, horny gluten, horny starch, crown starch, tip starch, and germs) of low, medium, and high protein grain.

The hulls contain the lowest percentage (about 4) of proteids, then the tip caps and white starchy parts. The germs are very similar as regards percentage of proteids, those of the low proteid grain containing rather more than those of the high proteid grain. The germs contain most of the oil and about 10 times the average percentage of ash of the other parts of the grain.

As regards the percentage amounts of the different parts of the low, medium, and high proteid grain, the tip caps, hulls, and germs increase with the increase of proteids in the entire grain, whilst crown starch and tip starch decrease. The horny gluten is lowest in the medium and highest in the high protein grain, and the horny gluten highest in the medium and lowest in the low protein grain. These discrepancies disappear if the two horny parts are considered as one.

The following table shows (1) the percentage of proteids in the grain and (2) the distribution of the proteids in (*a*) low, (*b*) medium, and (*c*) high proteid grain.

	Proteids per cent.			Distribution of proteids.		
	(*a*).	(*b*).	(*c*).	(*a*).	(*b*).	(*c*).
Tip caps	0·09	0·13	0·08	0·89	1·14	0·59
Hulls	0·27	0·23	0·23	2·75	2·07	1·85
Horny part ...	5·25	6·69	8·20	53·07	59·03	64·88
White starch...	2·37	2·00	1·80	23·98	17·63	14·22
Germs	1·91	2·28	2·33	19·31	20·14	18·45
	9·89	11·33	12·64	100·00	100·01	99·99

N. H. J. M.

Status of Phosphorus in Certain Food Materials and Animal By-products, with Special Reference to the Presence of Inorganic Forms. Edwin B. Hart and William H. Andrews (*Amer. Chem. Journ.*, 1903, **30**, 470—485).—Commercial feeding-stuffs of vegetable origin do not contain appreciable amounts of inorganic phosphorus. The same holds good in the case of animal foods with the exception of meat meal, which may contain more or less bone.

Germinated grains are rich in soluble organic phosphorus. The organic phosphorus of oats, maize, and wheat is not transformed into inorganic forms during germination (two weeks). Cow's fæces are not found to contain inorganic phosphorus. N. H. J. M.

Amounts of Nitrogen and Organic Carbon in some Clays and Marls. Norman H. J. Miller (*Q. J. Geol. Soc.*, 1903, **59**, 133—140).—Analyses of soils are given to show that, under moist conditions, decaying vegetable matter in soil tends to become more nitrogenous, on account of the greater ease with which gaseous compounds are formed with carbon than with nitrogen. In samples of clays and marls, taken from deep borings in various strata from the London Clay to the Lower Lias, the amount of calcium carbonate varied from 82·1 to 0 per cent., organic carbon from 1·299 to 0·299, and nitrogen from 0·069 to 0·021; the highest proportion of organic carbon to nitrogen was 40·6 : 1, and the lowest 8·8 : 1. L. J. S.

The Potassium of the Soil Soluble in Water and its Utilisation by Plants. Théophile Schloesing, jun. (*Compt. rend.*, 1903, **137**, 1206—1209. Compare Abstr., 1902, ii, 220 and 626).—The potassium soluble in water was determined in four different soils in which maize had been grown, and in samples of the same soils kept under the same conditions, but without vegetation. The uncultivated soils were found to contain an excess of potassium soluble in water, as compared with the corresponding samples which had grown maize, the difference being, in one case, exactly the same as the amount of potassium contained in the maize plant, and in the other three cases somewhat less than the amounts accounted for by the maize. N. H. J. M.

Analytical Chemistry.

Extract of Iris Flowers as a Sensitive Indicator. A. Ossendowsky (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 845—846).—By quickly washing the flowers of the Japanese iris (*Iris Kaempferi*) with cold water, and then heating a pound of the flowers on the water-bath with 500 c.c. of water for 3—4 hours, a dark violet solution is obtained which gives very sharp colour changes with acids and alkalis. With mineral acids, it becomes bright red; with organic acids, crimson-red; with alkalis, emerald-green; and with organic bases, bright green. T. H. P.

Efficient Asbestos or Graphite Muffle. James M. Pickel and C. B. Williams (*J. Amer. Chem. Soc.*, 1903, 25, 1277—1280).—A small muffle is described suitable for heating a single dish or crucible. It consists of a cylindrical receptacle with an internal diameter and height each of 9·5 cm. which is attached to an asbestos cylinder, 3·5 cm. high and 3·5 cm. in internal diameter; the latter fits on to an Argand burner, and is provided with a slot or hole through which the flame can be observed. The crucible to be heated is placed on a pipe-clay triangle within the receptacle, which is closed by a cover composed of asbestos, a plate of aluminium, and a sheet of platinum riveted together, the asbestos forming the top of the lid and the platinum the bottom; this lid is provided with a hole of about 3 cm. diameter.

The muffle can be made of asbestos board about 6 mm. thick, by soaking it in water, rolling it round a suitable core, and allowing it to dry. The lower cylinder is then fitted in and the whole bound together with wire. A more durable form can be made of graphite coated with an asbestos jacket. The lid also can be made of graphite. The muffle can be used with a Bunsen burner by supporting it on a tripod.

The author employs a battery of twelve of these small muffles for expelling the ammonium salts in the estimation of potash in fertilisers; it has the special advantage that from one to twelve estimations can be carried out simultaneously, each under separate control. E. G.

Calculation of the Results of Gas Analyses. Alfred Wohl (*Ber.*, 1904, 37, 429—433).—It is pointed out that, taking the latest values for the mol. volumes of different gases, for example, on the basis $O=1$, $H_2=1{\cdot}0017$; $CO=1{\cdot}0000$, $CH_4=1{\cdot}0020$; and $CO_2=0{\cdot}99393$ (Rayleigh, *Proc. Roy. Soc.*, 1898, 62, 204), Avogadro's hypothesis is only approximately correct, and that in accurate gas analyses this must be taken into consideration, and the calculations must be based on the actual molecular volumes.

Thus, in estimating hydrogen, carbon monoxide, and methane, where K = contraction, CO_2 the carbon dioxide formed, and O the oxygen used.

$$\begin{array}{lll}
H_2 & =0{\cdot}6670\,K \text{ and not} & 2/3\,K. \\
 & =2{\cdot}0034\,O \quad ,, & 2\,O. \\
CO & =1{\cdot}9760\,K \quad ,, & 2\,K. \\
 & =1{\cdot}0061\,CO_2 \quad ,, & 1\,CO_2. \\
CH_4 & =0{\cdot}4990\,K \quad ,, & K/2. \\
 & =1{\cdot}0082\,CO_2 \quad ,, & 1CO_2. \\
 & =0{\cdot}5010\,O \quad ,, & O/2.
\end{array}$$

When hydrogen, carbon monoxide, and methane are estimated together by combustion with air through a capillary tube, the equations become

$$\begin{array}{ll}
H_2 = & 1{\cdot}0005\,K - 1{\cdot}0017\,O - 0{\cdot}0060\,CO_2. \\
CO = & 0{\cdot}3329\,K - \qquad\quad O - 1{\cdot}3394\,CO_2. \\
CH_4 = & -0{\cdot}3336\,K + 1{\cdot}0020\,O - 0{\cdot}3340\,CO_2.
\end{array}$$

For ordinary work, these equations may be taken as:

$$\begin{array}{l}
H_2 = K - O - 0{\cdot}006CO_2; \\
CO = K/3 - O + 3/4\,CO_2 + 0{\cdot}006CO_2; \\
CH_4 = -K/3 + O - CO_2/3.
\end{array}$$

J. J. S.

Complete Gas Analysis by means of Pressure Measurements. ALFRED WOHL [with EICKMANN] (*Ber.*, 1904, 37, 433—451. Compare Abstr., 1903, ii, 39).—Complete gas analyses may be conducted by an extension of the method previously described. Descriptions of the most convenient methods of filling the flasks and of passing the gas from one flask to another are given. The unsaturated hydrocarbons may be absorbed by the aid of fuming sulphuric acid containing 5—7 per cent. of sulphuric anhydride. Hydrogen, carbon monoxide, and methane are estimated together by passing a mixture of the gas and air or oxygen through a Drehschmidt-Winkler platinum capillary tube and calculating the percentages from the contraction, the volume of carbon dioxide formed, and the volume of oxygen used (compare preceding abstract).

Full details as to method of procedure and calculation are given.

J. J. S.

New Method of Estimating the Halogen Elements in Organic Compounds. II. Chlorine and Bromine. HENRI BAUBIGNY and G. CHAVANNE (*Compt. rend.*, 1904, 138, 85—87).—In a previous paper (compare Abstr., 1903, ii, 510), a method of estimating iodine in organic compounds was described which consists in oxidising the compound with a chromic acid mixture in the presence of silver nitrate; in these circumstances, the chlorine and bromine are expelled and the iodine oxidised to iodate. If, however, the oxidation is effected in a long-necked flask provided with a ground-in glass stopper carrying two tubes, the one passing to the bottom of the flask and the other, shorter one, connected with a series of Liebig absorption bulbs charged with an alkaline solution of sodium sulphite, the escaping chlorine and bromine are retained in this solution and can be estimated in the usual way, whilst the iodine is retained as iodate in the mother liquor. In order to ensure complete absorption of the chlorine and bromine, the combustion must be conducted slowly, the last traces of the chlorine and bromine being removed from the flask by means of a current of air passing through the longer tube.

Results are given which show the accuracy of the method for the separation of bromine and iodine; a sketch of the distillation flask and absorption bulbs is also given. M. A. W.

New Chlorometric Method. J. Pontius (*Chem. Zeit.*, 1904, 28, 59—60).—The method is based on the fact that a solution of sodium hypochlorite containing excess of sodium hydrogen carbonate quantitatively oxidises potassium iodide to iodate.

7·1 grams of bleaching powder are rubbed in a mortar with water, diluted to one litre, and 50 c.c. of the mixture are introduced into a flask containing at least 3 grams of sodium hydrogen carbonate. When the latter has dissolved, 1 c.c. of starch solution (free from iodide) is added, and the liquid is at once titrated with *N*/10 potassium iodide, 1 c.c. of which represents 0·00355 gram of available chlorine.

The process may also be applied to bleaching liquors, but as they generally contain alkali hydroxides or carbonates, these should first be neutralised by judicious addition of boric acid. One hundred c.c. of the liquid are then mixed with 6 or, if they are very weak, with 9 grams of sodium hydrogen carbonate and the solution is titrated as before.

L. de K.

Estimation of Chlorates, Bromates, and Iodates. Léon Débourdeaux (*Compt. rend.*, 1904, 138, 147—148).—When a solution of a chlorate, bromate or iodate is boiled with oxalic acid in presence of manganese sulphate and sulphuric acid, the following changes take place:

$$HClO_3 + 3H_2C_2O_4 = 6CO_2 + 3H_2O + HCl$$
$$HBrO_3 + 3H_2C_2O_4 = 6CO_2 + 3H_2O + HBr$$
$$2HIO_3 + 5H_2C_2O_4 = 10CO_2 + 6H_2O + I_2$$

The above reactions are quantitative if certain precautions are taken; the solution must be made so as to contain 5 grams of manganese sulphate and 12 c.c. of concentrated sulphuric acid in every 100 c.c., moreover it is important that the temperature of the mixture should not be rapidly raised before boiling. After removing the halogen acids with silver nitrate, the oxalic acid remaining at the end of the operation can be titrated with permanganate. Having found the amount of oxalic acid used, the chlorate, bromate, or iodate in the original solution can be calculated from the equations given.

S. S.

Use of Ferrous Sulphate in the Estimation of Chlorates and Bromates. Isaac K. Phelps (*Zeit. anorg. Chem.*, 1904, 38, 110—112).—A weighed quantity of the chlorate is heated to boiling in a covered flask with an excess of standardised ferrous sulphate solution (approximately *N*/5) and about 15 c.c. of sulphuric acid (1 : 4). The contents of the flask are then rapidly cooled, diluted to 600 c.c. with previously boiled water, and, after the addition of 2 grams of manganous chloride, titrated with potassium permanganate solution.

The same process is adopted in the case of bromates, except that the excess of ferrous sulphate is titrated with *N*/10 iodine solution in alkaline solution, instead of with permanganate in acid solution. After cooling, the contents of the flask are nearly neutralised by adding a concentrated solution of sodium carbonate. From 2 to 3 grams of sodium-potassium tartrate and an excess of *N*/10 iodine solution are added. The mixture is then treated with an excess of potassium hydrogen carbonate and titrated with *N*/10 arsenious oxide solution, using starch solution as indicator. W. P. S.

Detection and Estimation of Hypochlorous Acid. Euthyme Klimenko (*Zeit. anal. Chem.*, 1903, 42, 718—724).—Hypochlorous acid mixed with potassium iodide liberates one atom of iodine for each molecule of HClO. On subsequent addition of hydrochloric acid, a second atom of iodine is set free. The equality of the two quantities of iodine is somewhat affected if the hypochlorous acid is added to highly concentrated solutions of potassium iodide, but by inverting the order and adding the iodide slowly to the hypochlorous acid, the difference practically disappears even with strong solutions. These reactions are not influenced by the presence of chlorine in the hypochlorous acid. M. J. S.

Estimation of Sulphides and Haloids in presence of Each Other. Walther Feld (*Zeit. anal. Chem.*, 1903, 42, 708—711).—When no other sulphur compounds are present, the mixture may be distilled with magnesium sulphate in a current of carbon dioxide and the hydrogen sulphide received in a standard iodine solution. The haloid is thereafter precipitated from the residue in the retort. Another method is to precipitate both sulphide and haloid with an excess of silver, and estimate the unconsumed silver in an aliquot part of the solution; the precipitate, without washing, is then distilled with hydrochloric acid and aluminium clippings in an atmosphere of carbon dioxide, and the hydrogen sulphide estimated as before. The same method serves for the reduction of thionic acids to hydrogen sulphide. The sulphur of the polysulphides may be converted into thiocyanate by treatment with potassium cyanide. The haloids are estimated in a separate portion of the solution, after boiling with magnesia and mercuric oxide, which precipitates all the sulphur compounds as mercuric sulphide. Should the original solution be alkaline, magnesium sulphate is added; acid solutions are neutralised with magnesia. Ammoniacal solutions must also be boiled with magnesia before adding the mercuric oxide. M. J. S.

Rapid Estimation of Sulphur in Coal and Coke. J. D. Pennock and Darwin A. Morton (*J. Amer. Chem. Soc.*, 1903, **25**, 1265—1269).—Sixteen grams of sodium peroxide and 0·7 gram of coal, or 11·5 grams of the oxide and 0·7 gram of coke, are carefully mixed with a spatula and introduced into a 40 c.c. nickel-plated, steel crucible, fitted with a lid perforated with a small hole for the introduction of a red-hot wire. The crucible is supported by a special stand placed in a beaker containing some water. The mass is fired, and after a few minutes the crucible is turned over into the water, which rapidly dissolves the fused mass.

After acidifying the solution, the sulphuric acid is estimated by the chromate process proposed by Andrews. [This consists in adding a solution of pure barium chromate in dilute hydrochloric acid, which precipitates the sulphuric acid with liberation of an equivalent amount of chromic acid; after precipitating the excess of barium chromate with ammonia, the chromic acid is estimated iodometrically.]

For a full description of both crucible and stand, the original article and illustrations should be consulted. L. de K.

Estimation of Nitrogen by Kjeldahl's Method. Robert Banks Gibson (*J. Amer. Chem. Soc.*, 1904, **26**, 105—110).—Kutscher and Steudel obtained incorrect results when using the Kjeldahl process in the analysis of creatine, uric acid, and similar compounds. Their method was to heat the substance with sulphuric acid and a crystal of copper sulphate, and to complete the oxidation with potassium permanganate.

The author, however, by applying the well-known Kjeldahl-Gunning process (heating with sulphuric acid and potassium sulphate) has obtained perfectly satisfactory results in the case of the following substances. (The heating was always continued for a considerable time after the acid mixture became colourless.) Uric acid, hippuric acid, tyrosine, leucine, urethane, thiocarbamide, hydroxyphenylmethylpyrimidine, aminobenzoic acid, and caseinogen. In the case of substances of unknown structure, the results obtained by this process should, of course, be verified by the absolute method. L. de K.

A Burette, and Normal Solutions for Kjeldahl's Nitrogen Estimation. Alfred W. Bosworth and Wilhelm Eissing (*Zeit. anal. Chem.*, 1903, **42**, 711—713).—By the use of a special burette and normal alkali, all calculations may be avoided. The burette, which is filled from below, is graduated from the bottom upwards. The acid is $N/2$, the alkali $N/14{\cdot}04$, and 1 gram of substance is taken. For each c.c. of acid used for absorbing the ammonia, 7·02 c.c. of alkali is introduced into the burette, and the reading of the alkali burette, after the titration, divided by 10, gives at once the percentage of nitrogen. M. J. S.

Gasometric and Gravimetric Estimation of Ammonia. E. Riegler (*Zeit. anal. Chem.*, 1903, **42**, 677—686).—When treated with excess of iodic acid, ammonia or its salts form the tri-iodate, $(NH_4)H_2(IO_3)_3$, which is insoluble in dilute alcohol. This salt, when brought into contact with hydrazine sulphate, reacts according to the equation $2(NH_4)H_2(IO_3)_3 + 9N_2H_4,H_2SO_4 = (NH_4)_2SO_4 + 8H_2SO_4 + 6HI + 18H_2O + 9N_2$, so that 1 c.c. of nitrogen (at 0° and 760 mm.) corresponds with 0·17 mg. of ammonia.

The ammonia solution (10 c.c. containing not more than 0·014 gram of NH_3) is mixed with 5 c.c. of a 20 per cent. solution of iodic acid and 25 c.c. of 95 per cent. alcohol. After an hour, the crystalline precipitate is collected on a small filter, and thoroughly washed with alcohol. The filter is then transferred to a cylinder attached to the bottom of a 200 c.c. flask, in the outer space of which there is placed 50 c.c. of a 2 per cent. solution of hydrazine sulphate. After connecting with a gas burette and equalising temperature and pressure, the flask is shaken until its contents, which at first are yellow, become colourless, and the volume of the nitrogen evolved is then read. The tri-iodate precipitate may also be collected on a weighed filter, dried over sulphuric acid in a desiccator, and weighed.

M. J. S.

Estimation of Hydrazine Free and Combined. Enrico Rimini (*Atti R. Accad. Lincei*, 1903, [v], **12**, ii, 376—381).—When a solution of hydrazine sulphate is boiled in a Schultze-Tiemann apparatus with an excess of mercuric chloride, and, after eliminating the air, a little concentrated potassium hydroxide solution is added, the whole of the nitrogen of the base is evolved and can be measured; the action takes place quantitatively according to the equation $N_2H_4,H_2SO_4 + 6KOH + 2HgCl_2 = K_2SO_4 + 4KCl + 2Hg + N_2 + 6H_2O$. The amount of hydrazine in semicarbazides can be rapidly and accurately estimated in the same manner.

Conversely, mercuric chloride may be estimated by means of hydrazine. In the case of dilute solutions of the chloride, an excess of hydrazine sulphate is added and the foregoing operation in the Schultze-Tiemann apparatus carried out at the boiling temperature. With more concentrated solutions, it is better to work in the cold, using a Lunge or Knopp and Wagner's nitrometer.

W. A. D.

Estimation of the Nitrogen in Hydrazones and Osazones by Kjeldahl's Method. J. Milbauer (*Zeit. anal. Chem.*, 1903, **42**, 725—732).—The author confirms the statement of Dakin (Abstr., 1902, ii, 533) that the addition of potassium persulphate is of great assistance in the oxidation of difficultly combustible organic substances by sulphuric acid. The process cannot, however, be employed directly for phenylhydrazine and its derivatives, in consequence of the tendency of these substances to evolve nitrogen when oxidised. After preliminary reduction by nascent hydrogen, the method can be applied with complete success. About 0·2 gram of the substance is mixed with 50 c.c. of water and 3 grams of zinc powder; 50 c.c. of concentrated sulphuric acid are gradually added, and the mixture is gently boiled until reduction is complete. A drop of mercury is added, and the boiling is continued until the mixture is colourless. After cooling to about 100°, 2 grams of potassium persulphate are added, and the liquid is again heated for about half an hour. It is then neutralised with soda, a few grams more of the persulphate are added, and the ammonia is distilled off. M. J. S.

Estimation of Nitrites in the Absence of Air. ISAAC K. PHELPS (*Zeit. anorg. Chem.*, 1904, 38, 113—116).—The apparatus used is the same as that previously described for the estimation of nitric acid (Abstr., 1903, ii, 240). An excess of standardised arsenious oxide solution and 25 c.c. of concentrated sodium carbonate solution are placed in the flask and boiled for from 5 to 8 minutes to drive out all air. Seven c.c. of sulphuric acid (1:4) are then run in through the funnel, and the contents of the flask cooled. As the pressure in the flask approaches that of the outside air, the delivery tube is raised out of the mercury, but still kept under the surface of a layer of water on the mercury. The nitrite solution to be estimated is then added together with two grams of potassium iodide and sufficient sulphuric acid (1:4) to acidify the contents of the flask. A concentrated solution of potassium hydrogen carbonate is now run in until all free iodine has been combined, the mixture is boiled for five minutes to drive out nitric oxide, cooled, and titrated with *N*/10 iodine solution, using starch solution as indicator. W. P. S.

Estimation of Small Amounts of Arsenic in Paints, Wall-papers, &c. PETER KLASON and JOHN KÖHLER (*Bihang K. Svenska Vet. Akad. Handl.*, 1902—1903, 28, ii, No. 4, 1—18).—Like phosphoric acid, free arsenic acid may be estimated by titration with alkali. Using potassium hydroxide with methyl-orange as indicator, the solution shows a neutral tint when KH_2AsO_4 is formed, whilst with phenolphthalein this occurs when the solution contains K_2HAsO_4.

With potassium iodate and iodide, arsenic acid acts as a monobasic acid, the reaction being: $KIO_3 + 5KI + 6H_3AsO_4 = 6KH_2AsO_4 + HIO_3 + 5HI$ and $HIO_3 + 5HI = 3H_2O + 3I_2$. The iodine may be determined by means of standard sodium thiosulphate solution. Small quantities (0·067—0·676 mg. of As_2O_5) of arsenic acid can be estimated in this way by using *N*/500 or *N*/1000 thiosulphate solution, but the titration must be carried out quickly and with vigorous shaking, as the liquid to which starch has been added very soon assumes a permanent blue colour, possibly owing to the action of the carbon dioxide of the air. The estimation of arsenious acid in small quantities after previous distillation with hydrochloric acid and oxidation with nitric acid does not give satisfactory results.

Mörner's method (Abstr., 1902, ii, 694) of estimating minute quantities of arsenic, which gives good results when applied to ochres and other colours, steel, copper, or wall-papers, gives very inaccurate results with woollen wares.

The dilute solutions (*N*/500 and *N*/1000) of sodium thiosulphate used by the author keep well. T. H. P.

Rapid Estimation of Boric Acid in Borax. K. Jacobi (*J. Amer. Chem. Soc.*, 1904, **26**, 91—92).—Two or four grams of the sample are dissolved in water; excess of glycerol and a few drops of phenolphthalein solution are added and the free boric acid is titrated with *N*/2 potassium hydroxide. The result multiplied by 2 equals the total boric acid in the sample. L. de K.

Estimation of Boric Acid as Phosphate. Franz Mylius and Adolph Meusser (*Ber.*, 1904, **37**, 397—401).—The compound BPO_4 (G. Meyer, Abstr., 1889, 108) may be considered as a mixed anhydride, boryl phosphate, $BO{\cdot}O{\cdot}PO_2$. Boric and phosphoric acids combine in sulphuric or acetic acid solution, or in acetic anhydride. Boric and phosphoric acids also combine when heated at 80—100°, forming a hydrated compound, *borylphosphoric acid*, $H_2(BO)PO_4$. The phosphate, prepared by either of these methods, is readily hydrolysed by water, but becomes inert after heating at 400°. At a white heat, the compound becomes distinctly crystalline.

In quantitative analysis, the boric acid is converted into methyl borate by distillation with methyl alcohol, phosphoric acid and an excess of ammonia are added to the distillate, and the whole is evaporated to dryness and ignited at 400° in a current of water-vapour, in which the ammonium phosphate and phosphoric acid volatilise, the residue being weighed as BPO_4. The error may amount to 1 per cent., due on the one hand to slight volatilisation of the boryl phosphate, and on the other to imperfect removal of phosphoric acid. C. H. D.

Estimation of Alkalis in the presence of Borates. K. Jacobi (*J. Amer. Chem. Soc.*, 1904, **26**, 88—91).—Silica is rendered insoluble as usual. The acid solution is precipitated with ammonia and ammonium oxalate, and the magnesium is then precipitated with ammonium phosphate. The phosphoric acid is now precipitated with ferric chloride and the excess of this removed by ammonia. The solution is freed from the bulk of ammonium salts by evaporation with 40 c.c. of nitric acid, and then again with 20 c.c. The residue is evaporated with excess of hydrochloric acid and finally brought to a dull red heat. The mass now consists of sodium (potassium) chloride, boric oxide, and regenerated sodium borate. After dissolving in water, the sodium existing as borate is titrated with *N*/2 sulphuric acid, using methyl-orange as indicator and the total boric acid is then titrated with *N*/2 potassium hydroxide in the presence of excess of glycerol, using phenolphthalein as indicator. The sum of the boric oxide and the sodium oxide subtracted from the total weight gives the sodium chloride, from which the sodium oxide is then found by calculation. Should potassium or sulphuric acid be present, these should be determined in a separate portion and allowed for. L. de K.

Estimation of the Alkalis in Vegetable Substances. Hugo Neubauer (*Zeit. anal. Chem.*, 1904, **43**, 14—36).—After a discussion of the inconveniences and deficiencies of the Fresenius method, the following process is proposed. The organic matter is oxidised and removed by heating the substance with sulphuric and nitric acids in a Jena glass flask. The solution is evaporated in a platinum basin and the excess of sulphuric acid expelled. The residue is freed from silica by evaporation with hydrochloric acid, and is then dissolved in water and rinsed into a 125 c.c. flask. A quantity of milk of lime sufficient to yield a saturated solution of calcium hydroxide is added, the flask is filled up, and after half an hour the solution is filtered through a dry filter. An aliquot part (100 c.c.) is neutralised with $N/2$ oxalic acid, which at the same time indicates whether sufficient lime has been added. A little more oxalic acid is added, the mixture is heated to boiling, and made slightly alkaline with ammonia. The precipitate is washed with cold water containing ammonium oxalate. The filtrate is evaporated and ignited to expel ammonium compounds. The residue, which may contain traces of silica and alkali carbonates, is converted into normal sulphates by ordinary methods, and the potassium is estimated by platinic chloride, employing the author's modification of Finkener's method, which is applicable to the sulphates. Sodium is calculated from the difference. Special experiments showed that the removal of iron and phosphoric acid by calcium hydroxide involved no loss of alkali metals, also that in a saturated solution of calcium hydroxide, magnesium hydroxide is so slightly soluble that the weight of the alkali sulphates may be corrected by subtracting 0·5 mg. for the magnesium sulphate remaining. The solubility of calcium hydroxide is considerably increased by the presence of alkali sulphates, being nearly twice as much in a 2 per cent. solution as in pure water. Satisfactory results were obtained in test experiments.

M. J. S.

Determination of Free Lime and on so-called "Dead Burnt" Lime. Edward H. Keiser and S. W. Forder (*Amer. Chem. J.*, 1904, **31**, 153—162).—A method is described for the estimation of free lime in Portland cement, basic phosphate slags, commercial quicklime, and similar substances, which is based on the fact that free lime combines almost instantly with water whilst basic calcium silicates are acted on much more slowly by water. A quantity of the substance, weighing 0·2—0·3 gram, is first heated in a platinum crucible to expel moisture, or, in the case of cements, is heated by means of the blow-pipe for a few minutes to expel carbon dioxide, and after cooling in a desiccator is again weighed. A few drops of recently boiled distilled water are added to the contents of the crucible, which is placed in a cylindrical brass receptacle provided with brass inlet and outlet tubes. This brass receptacle is then put into an air-bath and heated at 85° for about half an hour. A slow current of air, previously freed from moisture and carbon dioxide, is then drawn through the apparatus and the temperature raised to 185°. After the crucible has been thus heated for half an hour, it is transferred to a desiccator, and, when cold, is weighed. The increase is the weight of water which has united with the lime to form calcium hydroxide. A diagram of the apparatus is given.

It is generally supposed that when lime is very highly heated it becomes "dead-burnt" or inert to water, but experiments have shown that pure lime which has been treated in this way slakes comparatively readily with warm water.

Lime combined with silica in proportions not exceeding 3 mols. of lime to 1 mol. of silica is only slowly acted on by water, and this method of estimating lime can therefore be employed in presence of the di- and tri-calcium silicates which are assumed to be present in Portland cements.

Aluminates are hydrated much more rapidly than silicates, and an allowance must therefore be made for the water with which they combine. The various calcium aluminates take up varying quantities of water, and the authors intend to study this subject. They conclude, however, from experiments already carried out, that if a Portland cement containing less than 10 per cent. of alumina takes up more than 3 per cent. of water, the excess is due to the free lime present. E. G.

Estimation of Zinc in Zinc Dust. Alfred Wohl [and Eickmann] (*Ber.*, 1904, **37**, 451—453. Compare de Koninck, Abstr., 1903, ii, 758).—0·1788 gram of zinc dust is introduced into a flask of 100 c.c. capacity, fitted with stopcock. The temperature is kept at 20° and the pressure reduced by 700 mm. Five c.c. of hydrochloric acid of sp. gr. 1·1, containing a drop of platinic chloride solution are introduced. When the zinc is completely dissolved, the pressure is read off at the original temperature (compare Abstr., 1903, ii, 39), and the percentage of metal is given by the formula $(700 - p) \times 2$, when 0·1788 gram of dust was taken for each 100 c.c. capacity of the flask.

J. J. S.

Volumetric Estimation of Zinc. W. George Waring (*J. Amer. Chem. Soc.*, 1904, **26**, 4—29).—A lengthy article on the sources of error in the ordinary titration of zinc with ferrocyanide.

An important modification has been introduced in the analysis of zinc ores containing silica and heavy metals. The ore is decomposed with nitrohydrochloric acid (1 : 6), evaporated nearly to dryness with the addition of ammonium chloride, the residue is dissolved in water, and the filtrate boiled with a clean sheet of iron, or, better, aluminium, which precipitates the heavy metals. The filtrate is neutralised with sodium hydroxide, and then re-acidified with formic acid. From this solution, the zinc may be completely precipitated at 80° by cautiously passing a current of hydrogen sulphide until no further white precipitate is formed. The precipitate is collected and treated with dilute hydrochloric acid, which dissolves the zinc sulphide and leaves undissolved any cadmium sulphide which happens to be present. The solution of the zinc is mixed with some ammonium chloride and titrated with ferrocyanide. For other modifications and minute details necessary to ensure success, the original article should be consulted. L. de K.

Iodometry of the Precipitated Peroxides of Lead, Bismuth and Manganese. Erwin Rupp (*Zeit. anal. Chem.*, 1903, **42**, 732—735).—All attempts to precipitate lead, bismuth, and manganese in the conditions of their definite hydrated peroxides, by the use of alkaline hydrogen peroxide, sodium hypochlorite, bromine dissolved in alkali or in acetic acid, or alkaline potassium persulphate gave precipitates of a lower and generally variable degree of oxidation. A lead precipitate having approximately the composition $9PbO_2,PbO$ was obtained with bromine in acetic acid solution, but when chlorides were present the precipitation was incomplete.

Manganese also yielded with alkaline persulphate a precipitate containing 95—96 per cent. of MnO_2, but permanganate was formed if the precipitate was digested with the supernatant liquor for half an hour. The production of a definite peroxide precipitate seems to be possible only in cases where a solution acidified with a mineral acid can be used, as in Knorre's method for estimating manganese (Abstr., 1902, ii, 108). M. J. S.

Solubility of Lead Sulphate in a Hydrochloric Acid Solution of Stannous Chloride. A. VAN RAALTE (*Zeit. anal. Chem.*, 1904, 43, 36—38).—The solubility of lead sulphate in a hydrochloric acid solution of stannous chloride (Abstr., 1903, ii, 108) is due solely to the hydrochloric acid present. M. J. S.

Detection of Mercury in Urine. ADOLF JOLLES (*Zeit. anal. Chem.*, 1903, 42, 716—718).—The author defends his method (Abstr., 1900, ii, 576) against the strictures of Schumacher and Jung, and considers that the failure of the latter to remove the mercury completely from the urine by a gilt platinum plate was due to some defect in the condition of the gilt surface (compare Abstr., 1903, ii, 696). M. J. S.

Method of Separating Aluminium and Iron by means of Formic Acid. ANDRE LECLÈRE (*Compt. rend.*, 1904, 138, 146—147).—The solution of iron and aluminium should be fairly dilute and acidified with sulphuric acid. Ammonium formate is added in large excess and the solution boiled with ammonium thiosulphate. This treatment reduces all the iron to the ferrous state, and precipitates the aluminium as basic formate. The latter is collected and converted into oxide by ignition, whilst the iron can be precipitated as sulphide from the solution. S. S.

Estimation of Manganese. LÉON DÉBOURDEAUX (*Compt. rend.*, 1904, 138, 88—89).—The ordinary method of estimating manganese by determining (1) the amount of chlorine it liberates, and (2) the amount of hydrochloric acid necessary to furnish the chlorine, can be replaced by a much simpler process, involving the oxidation of oxalic acid by the higher oxides of manganese in the presence of warm dilute sulphuric acid. A comparison of the two series of equations

$$MnO_2 + 4HCl = MnCl_2 + Cl_2 + 2H_2O.$$
$$Mn_2O_3 + 6HCl = 2MnCl_2 + Cl_2 + 3H_2O.$$
$$Mn_3O_4 + 8HCl = 3MnCl_2 + Cl_2 + 4H_2O.$$

$$\begin{aligned}\text{and } MnO_2 + C_2H_2O_4,2H_2O + H_2SO_4 &= MnSO_4 + 2CO_2 + 4H_2O.\\ Mn_2O_3 + C_2H_2O_4,2H_2O + 2H_2SO_4 &= 2MnSO_4 + 2CO_2 + 5H_2O.\\ Mn_3O_4 + C_2H_2O_4,2H_2O + 3H_2SO_4 &= 3MnSO_4 + 2CO_2 + 6H_2O.\end{aligned}$$

shows (1) that the chlorine liberated in the first series is equivalent to the oxalic acid destroyed in the second series, and (2) the hydrochloric acid used up in the first series is equivalent to the sum of the sulphuric and oxalic acids involved in the second series.

In estimating manganese by the new method, the specimen to be analysed is gently heated with a known volume of a standard solution containing 35—40 grams of oxalic acid and 120 c.c. of sulphuric acid of 66° Beaumé per litre; the oxalic acid in the residual liquid is then estimated by means of a standard permanganate solution, and the total free acids by means of a standard ammonia solution, using fluorescein as indicator; the differences between these two values and the corresponding values of the original solution give the necessary data for calculating the chlorine and hydrochloric acid equivalents of the oxide under investigation. M. A. W.

Employment of Persulphates for Quantitative Separations. GEORG VON KNORRE (*Zeit. anal. Chem.*, 1904, **43**, 1—14).—The statement of Dittrich and Hassel (Abstr., 1902, ii, 693) that von Knorre's method for estimating manganese (Abstr., 1902, ii, 108) can be applied under certain conditions to separate that metal quantitatively from calcium, magnesium, zinc, cadmium, copper, nickel, and aluminium, cannot be confirmed. In consequence of the acidic character of manganese dioxide, weighable, and sometimes considerable amounts of the other metals are invariably carried down, even when working strictly as Dittrich and Hassel prescribe. The estimation of the manganese is not thereby vitiated if the amount is ascertained by titrating the precipitate after destroying the excess of persulphate by prolonged boiling. Cobalt, lead, and silver interfere with this method by yielding peroxides. Chlorides must not be present in large amounts. The separation of manganese and chromium is, on the contrary, perfectly satisfactory, the chromic oxide being converted into chromic acid. M. J. S.

Standardisation of Permanganate. A. SKRABAL (*Zeit. anal. Chem.*, 1903, **42**, 741—744).—With reference to the controversy between himself and Classen as to the purity of electrolytic iron deposited from an ammonium oxalate solution (Abstr., 1903, ii, 684, 759), the author points out that Verwer in 1901 (Abstr., 1902, ii, 693) showed that towards the end of the electrolysis carbonaceous iron is deposited, and that this fact invalidates the quantitative estimation of iron by electrolysis from Classen's solutions. Another impurity almost invariably present in Mohr's salt, which appears to have been overlooked by Classen, is zinc. In Classen's method, this impurity would tend to accumulate in the electrolytic iron, whereas in the author's it would not. M. J. S.

Iodometric Estimation of Uranium in Uranyl Compounds. B. GLASMANN (*Ber.*, 1904, 37, 189—191).—Uranyl salts interact with Stock and Massaciu's iodide iodate mixture (Abstr., 1900, ii, 247; 1901, ii, 284) according to the following equation: $3UO_2(NO_3)_2 + 5KI + KIO_3 + 3H_2O = 3UO_2(OH)_2 + 6KNO_3 + 3I_2$. The reaction proceeds quantitatively in the course of a few minutes when the solution is warmed. It is necessary that the solution should be neutral or only very faintly acid. The liberated iodine is driven over with steam and absorbed in a receiver containing potassic iodide solution, which is kept well cooled, and this solution may then be titrated with standard thiosulphate. The whole operation takes some 20 minutes.

J. J. S.

Colour Reactions of Vanadic Acid and Vinyl Alcohol. CAMILLE MATIGNON (*Compt. rend.*, 1904, 138, 82—84).—The rich blue coloration given by tannin and vanadic acid forms a very delicate test for the latter compounds, a solution containing 2 mg. of vanadium pentoxide per litre giving the blue colour. Similar colour reactions are given by gallic acid and pyrogallol; catechol gives a bluish-violet colour, but is a much less sensitive reagent than the other three; whilst resorcinol, quinol, guaiacol, and phloroglucinol give no coloration under the same conditions.

Commercial ethers which contain vinyl alcohol afford a more sensitive reagent for vanadic acid than any of the preceding compounds, since they give a rose coloration with solutions of ammonium vanadate or vanadic acid containing 1/10 mg. of vanadium pentoxide per litre. On allowing the ether to evaporate spontaneously, the residue becomes richer in vinyl alcohol and gives the characteristic rose colour with solutions containing 1/50 mg. per litre. That vinyl alcohol is the active principle in the ethers capable of giving the colour reaction was proved by the following facts (compare Poleck and Thümmel, Abstr., 1890, 118): (1) the active ethers gave a white precipitate with a solution of mercuric chloride and potassium hydrogen carbonate, (2) they lost their activity after treatment with potassium hydroxide, which resinifies the vinyl alcohol, and (3) they became inactive after being shaken with water, which dissolves the vinyl alcohol.

M. A. W.

Estimation of Dissolved Gases in Sea-water. ERNST RUPPIN (*Zeit. anorg. Chem.*, 1904, 38, 117—120).—The apparatus employed is that devised by Knudsen. It consists of a large, cylindrical bulb with a tube at the top and bottom. The upper tube is surrounded by a condenser, and above the condenser is closed by a 3-way tap, one opening of which connects with a funnel and the other with a gas-burette. The lower tube is joined to a mercury reservoir by means of tubing and is provided with a stop-cock. A side-tube, also fitted with a tap, is placed just above the stop-cock. After removing all air from the bulb by raising and lowering the mercury reservoir, a known volume (about 300 c.c.) of the sea-water contained in a sealed tube is admitted through the side-tube, one end of the sealed tube being broken under mercury and the other broken in the piece of india-rubber tubing by which it is connected to the side-tube. The nitrogen and oxygen are driven off by gently heating the water in the bulb, a ring burner at the lower part of the latter being used for this purpose. The gases are collected in the gas-burette. After disconnecting the condenser, 5 c.c. of sulphuric acid of sp. gr. 1·125 are run in through the funnel and the heating continued at 100—105° until all carbon dioxide has been evolved. This gas is also collected in the gas burette, and the mixed gases analysed as usual. A correction for the 0·06 c.c. of oxygen and 0·04 c.c. of nitrogen contained in the 5 c.c. of sulphuric acid must be made.

W. P. S.

Estimation of Carbon Dioxide in Natural Waters. LUDWIG W. WINKLER (*Zeit. anal. Chem.*, 1903, **42**, 735—740).—The total carbon dioxide of a natural water can be estimated by evolving hydrogen in the liquid and passing the mixed gases through an absorption apparatus. A stoppered bottle holding about 600 c.c. and of accurately known capacity is filled completely with the water to be examined, about 20 grams of granulated zinc having first been introduced. Into the neck of the bottle, a capacious cylinder is then fitted. This cylinder carries at the top a stopcock bulb and has a side-tube for conveying the gas to the potash bulbs. Boiled hydrochloric acid (50 c.c. of 18 per cent.) is placed in the bulb, a drop of platinic chloride is added, and the acid is gradually admitted to the apparatus. In about 3 hours, the whole of the carbon dioxide will have been carried over to the potash bulbs.

A new form of potash bulb which can be used ten times without refilling is described and figured. M. J. S.

Estimation of Organic Matter in Water. Inconvenience of Filtration of Samples through Paper before Analysis. C. LENORMAND (*Bull. Soc. chim.*, 1904, [iii], **31**, 139—141).—The author finds that in the passage of water through filter paper a certain amount of organic matter from the filter paper is dissolved by the water, and he suggests that determinations of "organic matter" should be made on unfiltered samples. The results of a number of determinations of "organic matter" in samples of sea and fresh waters before and after filtration through commercial filter papers are tabulated in the original. T. A. H.

Estimation and Separation of Cyanogen Compounds and the Impurities contained therein. WALTHER FELD (*Chem. Centr.*, 1903, ii, 1398—1400; from *J. f. Gasbel.*, **46**, 561—567).—*Alkali cyanides* are estimated in the presence of ferrocyanogen compounds by distillation with magnesium chloride, or, if the mass is likely to yield hydrogen sulphide, with a soluble lead salt; in either case, the hydrogen cyanide is quantitatively expelled and may be collected in aqueous sodium hydroxide and finally titrated with $N/10$ silver nitrate using potassium iodide as indicator.

Iron cyanogen compounds are decomposed by heating with an alkali hydroxide in the presence of mercuric chloride, and from the mercuric cyanide thus formed the hydrogen cyanide is liberated by distillation with sulphuric acid. Insoluble iron cyanogen compounds are first triturated with aqueous potassium hydroxide, then treated at the boiling heat with magnesium chloride, and then with a sufficiency of mercuric chloride.

Sulphur Compounds.—The compounds usually present in crude cyanides are hyposulphites, polysulphides, thiosulphates, and thiocyanates. On distilling the mass with magnesium chloride in a current of carbon dioxide, the hydrogen sulphide is expelled and may be titrated with standard iodine and thiosulphate; the inhibiting action of the hydrogen cyanide may be prevented by adding hydrochloric acid before titrating with the thiosulphate. Any sulphur existing as polysulphide separates as such and may be collected as usual. *Thiosulphates* and *thiocyanates* are quantitatively reduced to hydrogen sulphide by the action of sheet aluminium and hydrochloric acid. The separation of *thiocyanates* and *thiosulphates* is best effected by boiling with a mixture of mercuric and magnesium chlorides with magnesium oxide; this does not affect the thiocyanate, which may then be reduced as before with aluminium.

Analysis of "Crude Cyanogen." In the estimation of the cyanogen not in combination with iron, an aliquot part of the cold aqueous solution (to which a little magnesium chloride has been added) is precipitated with lead nitrate and the hydrogen cyanide is distilled off as previously directed. For the estimation of the soluble iron cyanogen compounds, the cyanogen of the alkali cyanides is first expelled by means of magnesium chloride, the hot liquid is then treated with sodium hydroxide and mercuric chloride, and, after boiling, the mercury cyanide is decomposed by distillation with sulphuric acid. For the determination of the insoluble iron cyanogen compounds, the alkali cyanides are first decomposed by evaporation with magnesium chloride, the mass is then treated with strong aqueous sodium hydroxide, boiled with addition of mercuric chloride, and finally distilled with addition of sulphuric acid, allowing, of course, for the soluble ferrocyanide. Sulphur compounds are estimated as previously directed. Thiosulphates only occur in very bad samples of gas-purifying material. L. DE K.

Estimation of Glycerol in Wine. JOSE G. GUGLIELMETTI and VICTOR COPPETTI (*Ann. Chim. anal.*, 1904, 9, 11—12).—Fifty grams of clean sand and 2·5 grams of animal charcoal are well mixed, 50 c.c. of wine are added, and the whole evaporated to dryness on the water-bath. After intimately mixing the mass with 5 grams of calcium oxide, the whole is extracted on the water-bath first with 50 and then twice in succession with 25 c.c. of absolute alcohol. The united filtrates are concentrated to 5 c.c., transferred to a tube, the dish is washed first with another 5 c.c. of alcohol, and then with 30 c.c. of pure ether. The whole is well shaken, allowed to settle, and filtered. The ethereal alcoholic liquid is then evaporated in a dish furnished with a close-fitting lid, the residual glycerol is dried for 45 minutes at 60—70°, cooled under a desiccator, and weighed. L. DE K.

Sodium Monosulphide as Indicator in the Estimation of Dextrose with Fehling's Solution. L. BEULAYGUE (*Compt. rend.*, 1904, 138, 51—53).—The titration of dextrose or any reducing sugar with Fehling's solution is often rendered inaccurate by the difficulty of obtaining a sharp end point to the reaction. This is especially the case when estimating the reducing sugars in diabetic urines. To overcome the difficulty, the author proposes the use of sodium monosulphide as an indicator. The method of titration and the precautions taken during the process are the same as those usually adopted. When the end of the reaction is approached, a drop of the titrated liquid is taken out and placed on a double piece of filter paper; the upper layer retains the cuprous oxide and allows some of the liquid to pass through to the lower sheet. A drop of the sulphide solution (10 parts of water to one part of crystallised sodium monosulphide) is placed in contact with the solution in the second layer of filter paper; if copper is present, a black or brown stain of copper sulphide is formed. By repeating this process at intervals during the titration, a point is reached when the sulphide fails to produce any colour even when the paper is examined by transmitted light. When this is attained, the reduction of the Fehling's solution is complete.

It is important that the Fehling's solution used should be standardised by the same method. S. S.

Estimation of Raffinose. David L. Davoll, jun. (*Zeit. Ver. deut. Zucker-Ind.*, 1903, 1041—1049).—The author has examined the various methods proposed for the estimation of raffinose in presence of sucrose, and finds that the method of inversion according to Clerget's directions gives the best results. It is best, however, to use as the clarifying material, not animal charcoal, but powdered zinc, which is allowed to act on the inverted solution at the temperature of inversion (69°). After cooling the liquid to 20°, the zinc should be filtered off by means of a plug of cotton-wool, which must, of course, be thoroughly washed; as, if the zinc is left in the solution, the continuous evolution of hydrogen prevents the liquid from being made up exactly to volume. T. H. P.

The Composition of Linseed Oil and the Estimation of the Saturated Fatty Acids. Wilhelm Fahrion (*Zeit. angew. chem.*, 1903, 16, 1193—1201).—A lengthy article dealing chiefly with Mulder's investigations (1867). The composition of linseed oil may be fairly expressed as follows: unsaponifiable, 0·8; palmitic and myristic acids, 8·0; oleic acid, 17·5; linoleic acid, 26·0; linolenic acid, 10·0; *iso*linolenic acid, 33·5; glycerol-residue (C_3H_2), 4·2. L. de K.

Estimation of Unsaponifiable Matters in Linseed Oils. Carl Niegemann (*Chem. Zeit.*, 1904, 28, 97).—The author has tested 18 specimens of undoubtedly genuine linseed oil and finds the amount of unsaponifiable matter to vary from 0·74 to 2·15 per cent. A very low percentage does not necessarily indicate a superior article. The estimations were made by Allen and Thomson's ether process (*Chem. News*, 1881, 43, 267). L. de K.

Some Indian Oils. Julius Lewkowitsch (*Analyst*, 1903, 28, 342—343).—*Pongam Oil.*—Obtained from pongam beans, the fruit of

Pongamia glabra, Vent., a tall tree growing all over East India. At 15°, the oil is a buttery mass of a dirty yellow colour. Two samples gave the following figures: sp. gr. 0·9352—0·9240 at 40°/40°; saponification number, 178—183·1; iodine number, 94·0—89·4; Reichert-Meissl number, 1·1; unsaponifiable matter, 9·22—6·96 per cent.; refractometer number, 78·0—70·0; free fatty acids (as oleic), 3·05—0·5 per cent. The first values were given by a sample extracted in the laboratory with ether; the second by a specimen obtained from India.

Margosa Oil.—This oil is obtained from the seeds of *Melia azedarach*, a large tree cultivated throughout India and Burma. It has a sp. gr. of 0·9023 at 40°/40°; saponification number, 196·9; iodine number, 69·6; Reichert-Meissl number, 1·1; refractometer number, 52. The oil is solid at the ordinary temperature.

Ben Oil.—A genuine sample gave a sp. gr. of 0·9127 at 15°/15°; iodine number, 72·2; and refractometer number, 50·0. A solid portion of oil of ben separated by filtration at 0° had an iodine number 109·9, whilst that of the liquid portion was 111·8.

W. P. S.

Analysis of Urine. Emil C. Behrendt (*Chem. Zeit.*, 1903, 27, 1270—1271).—*Uric Acid.*—Precipitation with barium chloride leads to erroneous results. Direct precipitation with hydrochloric acid is also incomplete. Ruhemann's iodine titration process (Abstr., 1902, ii, 435) gives very indifferent results with made up solutions of uric acid, but with urines the results agree fairly well with Salkowski's standard process, being, however, from 0·0038—0·0112 per cent. too low. Very good results may be obtained by Tunnicliffe and Rosenheim's volumetric piperidine process (Abstr., 1898, ii, 196).

Urea.—Riegler's process with Millon's reagent in a special apparatus (Abstr., 1897, ii, 390) is recommended.

Indican.—Ellinger's process (Abstr., 1903, ii, 620) is up to the present the most trustworthy process, as about 85 per cent. of the indoxyl is converted into indigo, but it requires time. L. de K.

Reaction of Cryogenine. Gustave Patein (*J. Pharm. Chim.*, 1903, [vi], 18, 593—594).—By mixing 1 c.c. of forty per cent. formaldehyde solution with 1 gram of cryogenine (*m*-semicarbazidobenzamide, $NH_2·CO·NH·NH·C_6H_4·CO·NH_2$), dissolved in alcohol, diluting with water and then adding 2 or 3 drops of hydrochloric acid, a white powder is precipitated quantitatively. The product is very sparingly soluble in alcohol, ether, or chloroform, and seems to be acted on by carbon disulphide. It commences to melt and becomes coloured at 205°.

The method does not give completely satisfactory results in the estimation of cryogenine in urine, and as a qualitative test, is not so characteristic as the green coloration and reduction on boiling with Fehling's solution. G. D. L.

Estimation of Morphine in Opium and Tincture of Opium. Edwin Dowzard (*Pharm. J.*, 1903, [iv], 17, 909—910).—Eight grams of the sample are treated with 100 c.c. of water in a closed flask for 1 hour at a temperature of 80—90° with constant agitation. The contents of the flask are then cooled, 3 grams of slaked lime are added, and the mixture again agitated for 1 or 2 hours. After filtration, 51·6 c.c. of the filtrate (equal to 4 grams of opium) are transferred to a corked flask, 5 c.c. of 90 per cent. alcohol, 30 c.c. of ether, and 2 grams of ammonium chloride are added, the flask is shaken for 30 minutes, and put aside for 12 hours. The contents of the flask are then poured on to a filter. The aqueous portion runs through, whilst the morphine remains attached to the filter, leaving the ether perfectly clear. The latter is removed by a pipette and the traces of morphine in the flask rinsed on to the filter with morphinated water. The filter and its contents are washed with morphinated water until free from chlorides, then once with 10 c.c. of distilled water, and finally with about 15 c.c. of ether, which after a few minutes is removed by a pipette. After being exposed to the air for 30 minutes, the filter and adhering morphine are placed in a beaker, broken up with a glass-rod, and gently heated with 20 c.c. of $N/10$ sulphuric acid solution. The mixture is now cooled and titrated with $N/10$ sodium hydroxide solution, using methyl-orange as indicator. Each c.c. of $N/10$ sulphuric acid is equivalent to 0·0283 gram of morphine, 0·05 gram being added to the weight of morphine found as directed in the B.P.

In the case of the tincture, 100 c.c. are evaporated to 30 c.c., cooled, 3 grams of slaked lime are added, and the mixture transferred to a 100 c.c. flask. Water is added up to the mark, any froth being removed by the addition of a drop of ether. Two c.c. of water are then added, and, after shaking for one hour, the contents of the flask are filtered. Fifty c.c. of the filtrate are operated on as described under opium.

Attention is drawn to a serious error in the B.P. method for estimating morphine in tincture of opium. Eighty c.c. of tincture and 3 grams of slaked lime are made up to 85 c.c. This volume should only be 81·9 c.c., as the 3 grams of lime together with extractive matter carried down by it displace 1·9 c.c. of water.

A table is given showing percentages of morphine in both opium and tincture of opium, for each 0·1 c.c. of $N/10$ sulphuric acid solution used, from 9 c.c. to 20 c.c. W. P. S.

Estimation of Morphine in Opium. P. L. Aslanoglou (*Chem. News*, 1903, **88**, 286—287).—Ten grams of the powdered opium are thoroughly extracted with three successive quantities of about 150 c.c. of water, each extract being filtered and evaporated. The united dry residues are dissolved in 75 c.c. of water, filtered, and washed with water to make 100 c.c. of filtrate. To the latter, 30 c.c. of 94 per cent. alcohol are added, and after stirring for 30 minutes, 3 to 5 c.c. of 10 per cent. solution of ammonia. At the end of 12 hours, the mixture is poured on a tared filter, the precipitate is washed twice with 25 c.c. of water, and partly dried at a temperature of 60°. The filter and precipitate are then washed with ether, dried at 75°, and weighed.

To the weight of morphine found, 0·1012 gram is added to correct for the solubility of morphine in the 184 c.c. of solution and wash-water employed. The true amount in the 10 grams of opium taken is then obtained. W. P. S.

Localisation of Morphine in the Animal Organism. M. TOTZE (*Chem. Zeit.*, 1903, **27**, 1239—1243).—A review of work done by other investigators, together with some of the author's own experiments. The analytical process used was that of Marquis (final extraction of the morphine by means of ethyl acetate; testing for the alkaloid with sulphuric acid and formaldehyde).

The bulk of the unaltered alkaloid passes into the urine, and a perceptible amount is also found in the fæces. All other organs should, however, if necessary, be examined. The author could not detect morphine in the pancreas and bile. L. DE K.

Van Deen's Reaction. NAZARENO TARUGI (*Gazzetta*, 1903, **33**, ii, 216—222. Compare Abstr., 1903, ii, 460).—An aqueous solution of the oxydase of wheaten flour, although not losing its power of producing a blue coloration with tincture of guaiacum when exposed to a temperature of 50° for 2 hours, fails to respond to this test after an exposure of 25 minutes at 75°, but if after this treatment a few drops of old turpentine oil or of hydrogen peroxide solution be added, the blue coloration is at once reproduced. But if the oxydase is heated for another 25 minutes at 75° or 50 seconds at 100°, the power of producing the coloration, even after adding the solutions mentioned, is destroyed.

Similarly, an aqueous extract of maize flour, when heated for 10 minutes at 75° or for 10 seconds at 100°, loses its power of direct oxidation, and the same is true of bean flour when heated for a minute at 100°; in each case, this property is restored by the addition of the oxidising agents mentioned.

When egg-albumin is rapidly coagulated by adding it to water at 75° and the clear solution filtered from the coagulum, it does not directly colour tincture of guaiacum, but does so on adding hydrogen peroxide; it appears that the albumin contains an oxydase, which is destroyed by heat, but regenerated by the oxidising agent.

It is pointed out that not only the foregoing substances are capable of giving Van Deen's reaction, but also many aldehydes, and even acid anhydrides, owing to the formation of peroxide-like intermediate products. W. A. D.

General and Physical Chemistry.

Spontaneous Emission of Light by Certain Uranium Salts. HENRI BECQUEREL (*Compt. rend.*, 1904, 138, 184—187).—The property possessed by certain radioactive substances of emitting light and heat energy has so far only been observed in the cases of radium and polonium; it is now found that certain salts of uranium are spontaneously luminous in the dark; the intensity of the luminosity appears to be constant, and to be most marked in the case of those salts which are rendered phosphorescent by the action of light. The most active salt in this respect is uranium potassium sulphate, some specimens of the double sulphates of uranium and sodium or ammonium are almost equally luminous, whilst crystals of the double uranium potassium chloride and one preparation of uranium ammonium oxalate emit a feeble light. Crystalline commercial uranium nitrate is distinctly luminous, whilst the phosphate and oxides of uranium and all the uranous salts, whether they are phosphorescent to light or the contrary, are not appreciably luminous under the conditions of the experiment. The luminosity of the active salts is not affected by preliminary exposure to the radiation from an electric arc, or to that of a radium salt, nor is it increased by placing the salts in contact with metallic uranium; it seems therefore to be due to the phosphorescence excited in the salt itself by the radiation emitted by the uranium it contains. The intensity of the luminosity as measured photometrically is about 20,000 times more feeble than that emitted by a specimen of radium chloride, the activity of which is about 10,000,000 times greater than that of the uranium salt. M. A. W.

Refractometric Studies Relating to the Constitution of some Cyanomethylenic Acids. ALBIN HALLER and PAUL T. MULLER (*Compt. rend.*, 1904, 138, 440—446).—The authors have determined the specific gravities and the specific refractions for the α, β, and γ-hydrogen lines and the D sodium line of the following alkyl cyanoacetoacetates: methyl cyanomethylacetoacetate, sp. gr. 0·8754 at 20°/4°, n_D 0·2421; methyl cyanoethylacetoacetate, sp. gr. 0·8755 at 20°/4°, n_D 0·2493; methyl cyanopropylacetoacetate, sp. gr. 0·8840 at 20°/4°, n_D 0·2560; ethyl cyanomethylacetoacetate, n_D 0·2517; ethyl cyanoethylacetoacetate, n_D 0·2546; ethyl *n*-cyanopropylacetoacetate, n_D 0·2600; ethyl cyano*iso*propylacetoacetate, n_D 0·2601; propyl cyanomethylacetoacetate, sp. gr. 0·8746 at 20°/4°, n_D 0·2578; amyl cyanomethylacetoacetate, sp. gr. 0·8743, n_D 0·2672, ethyl cyanoacetonedicarboxylate, sp. gr. 0·8809 at 20°/4°, n_D 0·2406; and of the following cyanoalkylmalonic esters: ethyl cyanomalonate, sp. gr. 1·0931 at 20°/4°, n_D 0·2345; ethyl cyanomethylmalonate, sp. gr. 1·0695 at 20°/4°, n_D 0·2382; ethyl cyanoethylmalonate, sp. gr. 1·0521 at 20°/4°, n_D 0·2439; ethyl cyanopropylmalonate, sp. gr. 1·0332 at 20°/4°, n_D 0·2495.

Tables are given of the molecular refractions for the different rays and of the molecular dispersions between the α- and γ-lines, and from the results the following conclusions are drawn: (1) all the cyanoalkylacetoacetates have the same constitution, the difference between the values of M_D for consecutive members approximating to 4·60, the normal increment for CH_2 according to Brühl and Conrady; (2) the cyanoalkylacetoacetates have the enolic $[RC{\cdot}OH{:}C(CN){\cdot}CO_2R']$, and not the ketonic $[RCO{\cdot}CH(CN){\cdot}CO_2R']$ structure (compare Haller, Abstr., 1900, i, 372); (3) the approximately constant difference (about +1·5) between the observed and calculated values for the molecular refractions is to be attributed to the accumulation of negative radicles (2CO and CN) in the molecule (compare Abstr., 1900, i, 182; Muller, Abstr., 1902, i, 354; 1903, i, 77, 78, ii, 705); a further confirmation of this point is afforded by the fact that the cyanoalkylmalonic esters, which exist only in the non-enolic form, $CN{\cdot}CR(CO_2R')$ (compare Haller and Blanc, Abstr., 1901, i, 260), show similar constant differences between the experimental and calculated values for the molecular refractions. M. A. W.

The Flame Spectra of the Alkali Metals. C. de Watteville (*Compt. rend.*, 1904, 138, 346—349).—An examination of the photographs of the flame spectra of the alkali metals (lithium, potassium, and sodium) shows that the lines of the metals can be divided into two groups, (1) those which belong to the principal series and which are equally intense from all parts of the flame, (2) those which belong to the secondary series, and which are more intense from the lower part of the flame. These results are explained on the hypothesis, confirmed by experiment, that the flame is divided into zones, each of which emits only one group of lines, for if an image of the whole flame is thrown on to the slit of the spectroscope by means of a lens of short focal length, the resulting spectrum is divided longitudinally into three parallel bands; in the lower region, which corresponds with the blue cone, there are, in addition to the carbon bands, all the lines of the metal; in the upper region, which corresponds with the highest part of the flame, only the very strong lines of the principal series are seen.

M. A. W.

Radioactivity of the Atmosphere. S. J. Allan (*Phil. Mag.*, 1904, [vi], 7, 140—150).—It has been previously shown that a negative conductor becomes radioactive in the atmosphere, and that the rate of decay of the radioactivity is independent of the nature of the wire, &c. (Rutherford and Allan, Abstr., 1903, ii, 123). The radioactivity can be removed from the wire by rubbing it with a piece of felt or leather moistened with ammonia, which then itself becomes radioactive. The rate of decay of the radioactivity of the felt or leather is not, however, equal to that of the wire, and varies with the nature of the felt, but the radioactivity of the ashes of the felt decays at the same rate as that on the wire. The rate of decay of the radioactivity of the residue obtained by the evaporation of freshly fallen snow was found to be different from that of the atmospheric radioactivity. The absorption of various solids was determined, and the experiments indicate the existence of α-radiation, readily absorbed, and more penetrating than β-radiation, and this explains the differences between the behaviour of the felt and the wire, as in the former the α-rays would be largely absorbed before reaching the surface of the felt. The absorption in gases was also examined. The increase of the conductivity of air caused by a water spray (at Montreal) was not due to any emanation in the spray, but is produced by the mixture of the water spray with the air. The experiments indicate the complexity of the atmospheric radioactivity and the necessity of further investigation. L. M. J.

The Emanation of Actinium. André Debierne (*Compt. rend.*, 1904, 138, 411—414).—The energy of the emanation proceeding from actinium, when measured by the ionisation of a gas, is found to decrease regularly from the moment of its production. If the logarithms of the intensities of ionisation are plotted as abscissæ against the time which has elapsed since the production of the emanation as ordinates, a straight line is obtained, the inclination of which is determined by a constant. In the case of actinium, this constant = 3·9 seconds. The emanation of actinium also has the property of endowing other substances with radioactivity. The power of inducing radioactivity on other substances does not decay in the same way as the ionising energy of the emanation; for a short period after the production of the emanation, the exciting power increases until a maximum is reached, after which, however, it falls off at the same rate as the ionising energy. It seems, therefore, that the two effects, induction of radioactivity and ionisation of gases, are quite distinct from one another; from this point of view, the actinium emanation must be regarded as containing two different sources of energy.

The induced radioactivity of actinium decays quite regularly; after forty minutes from the instant of production, it has decreased to half its strength. Substances containing actinium seem to emit a second emanation, which decays much more slowly than the principal one described above. S. S.

Heating Effect of the Radium Emanation. Ernest Rutherford and Howard T. Barnes (*Phil. Mag.*, 1904, [vi], 7, 202—222).—The experiments were conducted in order to determine how the heat emission of radium is connected with its radioactivity. For the measurement of the heat, a differential air calorimeter and platinum thermometers were employed; diagrams and descriptions of these are given. The emanation was driven off the radium bromide by heating, and was condensed in a tube surrounded by liquid air. The heating effect of the radium, when first tested, had fallen and continued to fall for about 3 hours, when it reached a minimum of about 30 per cent., after which it gradually increased, reaching its original value in about a month. Complementary changes were observed in the case of the emanation tube, so that the sum of the heating effects of the radium and the emanation tube during the whole course of the experiments was always equal to that of the original radium. The authors therefore conclude that about 75 per cent. of the heat is not due to radium directly, but to the emanation and the active matter it produces (termed emanation X). It was found that the curve of diminution of the heating effect of the emanation is nearly identical with the curve for the loss of radioactivity, and hence supports the view that the heat emission is an accompaniment of the expulsion of the α-rays. About 10 minutes after the removal of the emanation, the heating effect of radium is about 45 per cent. of the original; the gradual decay from this point to the minimum is due to the decay of activity of the "emanation X" left behind, and the curve was found to be similar to the decay to zero of the emanation tube after the removal of the emanation itself. The decay curves indicate 3 well-marked changes in the emanation X. In the first, half the matter is transformed in 3 minutes; in the second, half in 34 minutes; and in the third, half in 28 minutes. These changes will be discussed in a later paper, but the authors now state that the first is accompanied by α-rays, the second is not, and the third is accompanied by α-, β-, and γ-rays. The proportion of the heat effect due to the radium is about 25 per cent., that due to emanation and first change to emanation X, about 41 per cent., and that due to the second and third change about 34 per cent. The energy stirred up in the emanation is enormous, and the authors calculate that 1 c.c. would liberate per hour from $1{\cdot}25 \times 10^5$ to $1{\cdot}25 \times 10^6$ gram calories, and that 1 gram can radiate an amount of energy lying between 2×10^9 and 2×10^{10} gram calories.

L. M. J.

Influence of the Electric Discharge at Points on the Combination and Decomposition of Gases. Alexandre de Hemptinne (*Zeit. physikal. Chem.*, 1903, 46, 13—20).—Two similar tubes, connected on the one hand with a pump, and on the other with two separate manometers, are each provided with two platinum electrodes, a point and a disc. The tubes are filled with the same gas or gaseous mixture, and are so arranged that when the negative discharge takes place at the point in the one tube, it takes place at the disc in the other tube.

When the tubes are filled under low pressure with a mixture of hydrogen and oxygen, or a mixture of carbon monoxide and oxygen, combination takes place much more rapidly in the tube in which the point discharge is negative, the difference becoming more marked with diminishing pressure (compare Abstr., 1903, ii, 199). The synthesis of ammonia is slightly favoured by a negative point discharge, but the decomposition of ammonia and of carbon disulphide is not affected by the nature of the discharge so long as the pressure is greater than 5 mm. Whether a Wimshurst machine or a Ruhmkorff coil is the source of the electricity, it is found that the greater the difference in the light effects in the two tubes, the greater is the difference in the rates of combination; combination and decomposition appear to be effected especially in the luminous portions of the gas. J. C. P.

Dielectric Constants of Solvents and Solutions. Harold Everett Eggers (*J. Physical Chem.*, 1904, 8, 14—36).—The dielectric constants were determined by the method employed by Drude (Abstr., 1897, ii, 438), and the following results were obtained:

Substance.	Temperature.	Dielectric constant.	Substance.	Temperature.	Dielectric constant.
Methyl thiocyanate..	15·5°	33·3	Thiophen	13·0°	2·85
Ethyl thiocyanate ...	11·5	31·2	Ethyl disulphide...	19·0	15·6
Amyl thiocyanate ...	19·5	17·1	Thioacetic acid ...	21·0	17·3
Methylthiocarbimide	40·0	17·9	Acetylacetone ...	18·0	25·7
Ethylthiocarbimide...	15·0	22·0	Acetyl methylhexyl ketone ...	19·0	27·4
Allylthiocarbimide ...	17·6	17·3	Malononitrile ...	32·6	46·3
Phenylthiocarbimide	11·6	8·5	Pinacolin	17·5	12·6
Amylhydrosulphide..	18·0	4·9	Nitroanisole ...	19·8	23·8
Phenylcarbimide ...	17·0	3·36			

In a homologous series, the dielectric constant decreases as the molecular weight increases. The high value for malononitrile appears to indicate that separation of the cyanide groups causes a rise of the dielectric constant, the value for cyanogen being 2·52 and for succinonitrile 61·2. The dielectric constants of solutions were then determined, the following being employed: sulphur, phosphorus, menthol, and camphor in carbon disulphide, menthol and camphor in benzene, and menthol in acetonitrile. It is found that the simple volumetric formula $[k=(k_1v_1+k_2v_2)/(v_1+v_2)]$ does not give even approximate values for the constant and is inapplicable.

When the same compound is dissolved in different solvents, the values indicate influence of the solvent; this the author considers to be probably due to the formation of indefinite compounds.

L. M. J.

Liquid Hydrogen Chloride as an Electrolytic Solvent. Demetrio Helbig and G. Fausti (*Atti R. Accad. Lincei*, 1904, [v], 13, 30—37. Compare Steele and McIntosh, Proc., 1903, 220).—Liquid hydrogen chloride at its boiling point (−80·3°), under the ordinary pressure, has a specific conductivity $0·167 \times 10^{-6}$, which is approximately that of pure water; the conductivity is not changed by the addition of the chlorides of potassium, lithium, ammonium, copper, lead, platinum, gold and antimony, which are all insoluble in the liquefied gas. Stannic chloride dissolves in liquid hydrogen chloride but does not alter its conductivity. Ice cooled to −80° neither dissolves in the liquid nor changes the conductivity; on raising the temperature, the liquid boils, but the resistance remains constant.

For the details of the method used in the measurements, the original should be consulted; the hydrogen chloride was maintained at its boiling point by cooling it with a current of air which had been passed through a Dewar's vessel of liquid air. W. A. D.

Electrical Conductivity of Solutions in Thiocyanates and Thiocarbimides. Louis Kahlenberg (*Zeit. physikal. Chem.*, 1903, 46, 64—69).—The solvents used and their specific conductivities were as follows: methyl thiocyanate, $7·38 \times 10^{-6}$; ethyl thiocyanate, $4·8 \times 10^{-6}$; amyl thiocyanate, $1·47 \times 10^{-5}$; ethylthiocarbimide, less than $3·63 \times 10^{-7}$; allylthiocarbimide, less than $4·3 \times 10^{-8}$. The dielectric constants of these solvents have been determined by Eggers, and are respectively 33·3 (at 15·5°), 31·2 (at 11·5°), 17·1 (at 19·5°), 22·0 (at 15·0°), 17·3 (at 17·6°).

Most salts are insoluble in these substances, but ferric chloride, silver nitrate, mercuric chloride, trichloroacetic, and trichlorolactic acids were found to be soluble in the thiocyanates: ferric chloride and trichloroacetic acid are soluble also in the thiocarbimides, but these solvents are decomposed by silver nitrate and mercuric chloride. The solutions in methyl thiocyanate have the highest conductivity, and the thiocarbimide solutions have a low conductivity. The conductivity of ferric chloride in thiocyanates and thiocarbimides is much lower than in water or liquid hydrogen cyanide, and is of the same order as that in methyl and ethyl alcohols. The conductivity of silver nitrate in methyl and ethyl thiocyanates, and of mercuric chloride in ethyl thiocyanate is much lower than in aqueous solutions of corresponding strength. The conductivity of solutions of trichloroacetic acid in the thiocyanates and specially in the thiocarbimides is extremely low, and yet the solutions rapidly attack metallic magnesium or dry sodium carbonate. J. C. P.

Electrical Conductivity of Aqueous Solutions at High Temperatures. I. Description of the Apparatus. Results with Sodium and Potassium Chlorides up to 306°. Arthur A. Noyes and William D. Coolidge (*Zeit. physikal. Chem.*, 1903, **46**, 323—378).—The authors have constructed a platinum-lined bomb of 124 c.c. capacity, provided with electrodes insulated where needful by quartz-crystal cylinders. Details of the construction of this apparatus are given in the paper. With this bomb, the conductivity and specific volume of aqueous solutions of sodium and potassium chlorides (from 0·1—0·0005 normal) have been determined at 140°, 218°, 281°, and 306°.

The variation of the dissociation with concentration at these temperatures is not that required by Ostwald's dilution law, any more than at the ordinary temperature. Of the various empirical expressions that have been proposed for the change of conductivity with concentration, that of Kohlrausch ($\Lambda_o - \Lambda = KC^{\frac{1}{3}}$) is the most satisfactory. Barmwater's expression (Abstr., 1899, ii, 274) also gives good results, except at the highest temperature. To make applicable the general function $\Lambda_o - \Lambda = K\Lambda^n C^{n-1}$, the value of n must be varied not only with the nature of the salt but also with the temperature.

The conductivity values extrapolated for infinite dilution vary with the temperature in an approximately linear manner, although there are deviations up to 3·5 per cent. in the case of potassium chloride at 281° and 306°. The temperature cœfficients (referred to the values at 18°) are 3·05 per cent. for sodium chloride between 18° and 306°, 2·74 per cent. for potassium chloride between 18° and 218°.

The migration velocities of the potassium and sodium ions tend to become equal as the temperature rises, for the ratio of the conductivities of the chlorides at infinite dilution decreases from 1·19 at 18° to 1·04 at 306°.

At the same temperature and concentration, the degrees of dissociation of sodium and potassium chlorides are nearly equal. The percentage dissociation in $0{\cdot}1N$ solution is approximately as follows: 84 per cent. at 18°, 79 per cent. at 140°, 74 per cent. at 218°, 67 per cent. at 281°, and 60 per cent. at 306°. The change of dissociation with concentration is accurately given at all temperatures by the equation $(1-x)/C^{\frac{1}{3}}=K$. The conductivity of the vapour over a 0·1 N-solution of potassium chloride at 306° is certainly less than 1/200,000th part of that of the solution itself.

The specific volume of the 0·002 N-solutions (practically the same as that of pure water) was found to be 1·186 at 218°, 1·336 at 281°, and 1·434 at 306°. The expansions of the two 0·1 N-solutions agree very closely, but are somewhat less than that of water. For these solutions, the ratio of the specific volume at 306° to that at 4° is 1·422. J. C. P.

Organic Solvent and Ionising Media. I. Paul Walden (*Zeit. physikal. Chem.*, 1903, **46**, 103—188. Compare Abstr., 1902, ii, 247).—To discover how far the views adopted in connection with the conductivity of water and aqueous solutions may be extended to other media, the author has made an exhaustive study of nearly forty organic solvents, including representatives of the alcohols, aldehydes, ketones, acids, acid anhydrides, chlorides, bromides, and amides, esters, nitriles, thiocyanates, thiocarbimides, and nitro-compounds. To facilitate comparison, one solute has been used throughout, namely, tetraethylammonium iodide.

The present paper deals exclusively with the solvents, and contains first a detailed account of investigations hitherto made on the conductivity of pure organic substances and their solutions. In describing his own work, the author lays stress on the purification of the various solvents, and shows how the degree of purity is evidenced by the conductivity. Successive fractions of a liquid distilling at a constant temperature have not the same conductivity. A minimum value for the conductivity of each solvent has been reached; thus, taking one or two common substances as examples: methyl alcohol, $1{\cdot}45\times10^{-6}$; ethyl alcohol, $1{\cdot}985\times10^{-7}$; acetone, $2{\cdot}27\times10^{-7}$, all at 25°; acetaldehyde, $1{\cdot}20\times10^{-6}$ at 0°. In the majority of cases, the minimum value of the conductivity reached, which may be regarded as the characteristic conductivity of the substance, lies at 25° between 1×10^{-7} and 5×10^{-7}. The conductivity increases with the temperature, and the temperature coefficient varies with the class of substance. In homologous series, the first member has the highest conductivity. A few solvents are found to have an exceptionally high conductivity, for example, formamide, $4{\cdot}7\times10^{-5}$; acetamide (at 81°), 29×10^{-5}; dimethylnitrosoamine, 3×10^{-5}; acetylacetone, $1{\cdot}6\times10^{-5}$; formic acid, $1{\cdot}5\times10^{-5}$; values which approach those for fused electrolytes. The existence of a definite conductivity for each substance points to ionisation, and the author makes suggestions as to the ions probably present in each case.

In view of the parallelism suggested by Nernst and by Thomson between dielectric constant and dissociative power, the author has determined the dielectric constants of most of the solvents (and some other organic and inorganic substances) by Drude's method. He finds that the dielectric constants of acid, acid chloride, anhydride, and amide increase in the order given. The comparative effect of various substituent groups on the dielectric constant may be seen from the following values: $CH_3{\cdot}NO_2$, 38·2; $CH_3{\cdot}CN$, 35·8; $CH_3{\cdot}CNS$, 35·9; $CH_3{\cdot}OH$, 32·5; $CH_3{\cdot}NCS$, 19·7. Of the nitroparaffins and alkyl nitrates, the former have the higher values of the dielectric constant. The introduction of sulphur sometimes increases, sometimes diminishes the dielectric constant; compare $CH_3{\cdot}CO_2H$, 6·46; $CH_3{\cdot}CO{\cdot}SH$, 12·8; $C_2H_5{\cdot}OH$, 21·7; $C_2H_5{\cdot}SH$, 7·9. The dielectric constant is shown to be a markedly constitutive property, but in general it may be said that the passage from the first to the second member of a homologous series means a fall in the dielectric constant of about 50 units, whilst the passage from the second to the third member means a further fall of about 10 units. J. C. P.

Ionisation caused by the Impact of Negative Ions of Incandescent Carbon. JOHANNES STARK (*Chem. Centr.*, 1904, i, 424; from *Phys. Zeit.*, **5**, 51—57).—An ion which moves through a large difference of potential without collision may gain so much kinetic energy that it becomes able to ionise a neutral particle of gas by its impact. An electric discharge was passed through a gas contained in a glass globe, a metallic pin serving as anode and a ∩-shaped carbon filament as cathode. The latter was raised to incandescence; the high temperature caused strong electrification and ionisation at the surface of the cathode. The *E.M.F.* of ionisation was constant and not affected by temperature; for negative electron-ions in mercury vapour and in nitrogen, it was found to be 11 and 27 volts respectively.

The original paper also contains many other theoretical discussions and conclusions in regard to the influence of the surface of the solid on ionisation and current strength, secondary currents, &c.

E. W. W.

Hydrogen Peroxide Ions and their Discharge Potential. GIACOMO CARRARA and A. BRINGHENTI (*Gazzetta*, 1903, **33**, ii, 362—371).—Measurements are given, with curves illustrating them, of the potential difference necessary to produce a current in normal solutions of sulphuric acid containing hydrogen peroxide. It is shown that in such solutions a current passes between a large, non-platinised platinum electrode covered with oxygen as the anode, and a platinum point as cathode at an *E.M.F.* of 0·26 volt, whereas under similar conditions in the same solution free from hydrogen peroxide, an *E.M.F.* of 1·08 volts is necessary. Making the large plate the cathode and the point the anode, the current passes at an *E.M.F.* of 0·39 volt in the presence of hydrogen peroxide, instead of 0·60 in its absence. The shape of the curves of cathodic polarisation plotted between *E.M.F.* and current indicate the existence of only hydrogen cathions, and confirm the view that hydrogen peroxide is a weak acid. It is probable that the anions are univalent $\cdot HO_2$, to which a discharge potential 1·47 volts is to be attributed.

W. A. D.

Effect of Ions on the Decomposition of Hydrogen Peroxide by Platinum Black. C. Hugh Neilson and Orville H. Brown (*J. Amer. Physiol.*, 1904, 10, 225—228).—In general, the cathion has an inhibiting or depressing effect, and the anion an accelerating effect.

W. D. H.

Effect of Ions on the Decomposition of Hydrogen Peroxide and the Hydrolysis of Ethyl Butyrate by an Aqueous Extract of Pancreas. C. Hugh Neilson and Orville H. Brown (*J. Amer. Physiol.*, 1904, 10, 335—344).—The effect of certain salts in inhibiting the decomposition of hydrogen peroxide, and to a less degree the hydrolysis of ethyl butyrate by a pancreatic extract, can be explained by the hypothesis that the cathions have a depressing and the anions an accelerating action. W. D. H.

Experiments on Ionic Reactions. F. Dupré (*Chem. Zeit.*, 1904, 28, 186).—No precipitate is formed when hydrochloric acid and a little barium chloride are added to an aqueous solution of potassium chromate; addition of sodium acetate diminishes the concentration of the hydrogen ions, and thus causes a precipitate. When a solution of copper sulphate and sodium chloride is boiled, the colour changes to green. The effect of dilution on solutions of copper chloride and cobalt chloride respectively was also studied. The separation of sulphur from a mixture of sodium thiosulphate and acetic acid, is prevented by the addition of sodium acetate. A. McK.

The Influence of Complex Ions on Electrolysis by an Alternating Current. André Brochet and Joseph Petit (*Compt. rend.*, 1904, 138, 419—421).—It is shown that the presence of complex ions is not necessary to the action of an alternating current on a solution. This is supported by the mention of many cases where an alternating current produces changes in the composition of a liquid although the formation of complex ions is excluded. In all these instances, one or more of three phenomena are observed: (1) the evolution of electrolytic gas, (2) dissolution of electrodes, (3) oxidation or reduction. A few cases were examined where complex ions were present which are not decomposed by the ordinary continuous current. It was found that iron, cobalt, and platinum dissolve easily in aqueous potassium cyanide under the influence of an alternating current, giving potassium ferrocyanide, cobalticyanide, and platinicyanide respectively; if, however, the metals are used as anodes solution does not take place. S. S.

Electrolysis with Alternating Current. Max le Blanc and K. Schick (*Zeit. physikal. Chem.*, 1903, 46, 213—243).—When a continuous current passes through a solution of sodium thiosulphate with cadmium electrodes, cadmium dissolves from the anode and forms cadmium sulphide, whilst hydrogen is liberated at the cathode. With an alternating current of fairly high frequency, no cadmium sulphide is formed, but with lower frequencies the yield rises to as much as 77 per cent., when the contents of the cell are well mixed. That in these circumstances any cadmium sulphide at all is obtained is due to the removal of the dissolved cadmium from the reducing action of the next current impulse. The electrolysis of sodium thiosulphate with alternating current between silver or zinc electrodes gives similar results.

With an alternating current in a solution of potassium cyanide between copper electrodes, the question arises whether the copper that dissolves during one current impulse is reprecipitated on the electrode by the subsequent opposing impulse. If the copper ions have had time to form a complex with the potassium cyanide, the copper will remain in solution, and hydrogen will be liberated during the second current impulse. Actual experiments showed that in a $4N$ solution of potassium cyanide, with a current density of 4·6 amperes per square decimetre and any frequency up to 700 per minute, the copper went quantitatively into solution, and hydrogen was correspondingly liberated. With a frequency of 3400, 91 per cent. of the theoretical quantity of copper went into solution, with a frequency of 17,600, 58 per cent., and with a frequency of 38,600, 33 per cent. Contrast with this the result of electrolysing sodium hydrogen sulphate with an alternating current between copper electrodes. Copper forms no complex with hydrogen sulphate, and it is accordingly found that with a frequency of 1000 or upwards only very little copper goes into solution. With falling potassium cyanide concentration and diminishing current density, the amount of copper which goes into solution for a given frequency falls off; thus, in a $0·1N$ solution of potassium cyanide, with a current density of 2·3 and a frequency of 40,000, practically no copper goes into solution. The results as a whole show that the velocity with which the simple copper ions react to form the cyanide complexes is very great, but yet measurable.

Similar experiments have been carried out with silver, zinc, and nickel. Silver forms the complex $Ag(CN)_2'$, but the metal can be liberated from this at the cathode, and so it is found that with a frequence of 1090 only 6 per cent. of silver is in solution. Zinc and nickel behave like copper, and in all three cases it appears that the velocity of reaction between the metallic ions and potassium cyanide is of the same order. The temperature-coefficient of this velocity is very small for copper, and even for zinc much smaller than is usual in chemical reactions. In order to obtain consistent results on the above lines, care must be taken that the electrodes have a crystalline appearance.

Other interpretations of the recorded phenomena may be suggested, but on the whole the explanation in terms of the reaction between copper and cyanide ions is the most suitable. J. C. P.

Use of Alternating Currents in Electrolysis. André Brochet and Joseph Petit (*Compt. rend.*, 1904, **138**, 359—361).—Le Blanc and Schick (*Zeit. Elektrochem.*, 1903, 9, 636) have shown that the solubility of copper in potassium cyanide under the influence of an alternating current, produced from a continuous current by means of a commutator, varies with the frequency, being quantitative for a frequency of 0·5 per minute, but diminishing as the frequency rises to 20,000 per minute [compare preceding abstract]. Similar results have been obtained by the authors using the current from a de la Rive electric sector with a frequency of 42; they find that the following equation represents the limit reaction: $Cu_2 + 8KCN + 2H_2O = Cu_2(CN)_2,6KCN + 2KOH + H_2$. Zinc and nickel behave similarly, yielding double salts of the type $M(CN)_2,2KCN$, whilst lead, silver, mercury, or cadmium give no double salts. M. A. W.

Reduction Phenomena produced by the Action of Alternating Currents. Francis Pearce and Charles Couchet (*Compt. rend.*, 1904, **138**, 361—362).—When certain saline solutions are subjected to the action of an alternating current, either the electrodes are dissolved as observed by Le Blanc and Schick, or the dissolved salts are more or less completely reduced; the latter phenomenon is dependent on the nature of the electrodes, those formed of readily oxidisable metals being the most effective, and also on the density and frequency of the current; with a current of low density, the electrodes only are oxidised, whilst with a high density current the dissolved salt is also reduced. Solutions of ferric alum are only slightly reduced in the presence of platinum electrodes, much more reduced when electrodes of aluminium, lead, or cadmium are employed, whilst with iron electrodes the reduction is almost complete. Solutions of alkali nitrates are reduced quantitatively to nitrites with electrodes of cadmium or zinc, whilst with iron, copper, or carbon electrodes there is practically no reduction. Under similar suitable conditions, cupric salts are reduced to the cuprous state, mercuric to mercurous salts, or chromates to chromium salts, and nitrobenzene to a salt of aniline. M. A. W.

Electrolytic Dissociation of Picric Acid. Victor Rothmund and Karl Drucker (*Zeit. physikal. Chem.*, 1903, **46**, 827—852).—If it is assumed that picric acid in water obeys the mass action law (Ostwald's dilution law), and that there is a constant partition coefficient for undissociated picric acid between water and benzene, it can be shown by determining the distribution of picric acid between these two media that the mass action constant varies slightly but irregularly with the concentration, and has a mean value of 0·164 at 18°. An attempt was made to calculate the mass action constant for picric acid from freezing point depressions, but the experimental determinations are not sufficiently accurate to allow of this. When the degree of dissociation of picric acid is deduced from the conductivity of its solutions, the mass action constant varies markedly with the concentration. Attention is drawn to the great effect on the constant of a slight change in the value of λ_{∞}, and in view of the validity of the mass action law, established for picric acid by the partition experiments, the results obtained from the freezing point or the conductivity are probably vitiated by experimental errors. The authors consider that the deviations of strong acids from the mass action law have been exaggerated. J. C. P.

Influence of Non-electrolytes and Electrolytes on the Degree of Dissociation. MEYER WILDERMAN (*Zeit. physikal. Chem.*, 1903, **46**, 43—63).—In the case of gaseous dissociation, the introduction of an indifferent gas does not affect the degree of dissociation, and the author shows that the analogous statement is valid in the case of electrolytic dissociation. With the help of the freezing point method, it is shown that the presence of a non-electrolyte (glycerol) does not appreciably affect the degree of dissociation of either dichloroacetic or *o*-nitrobenzoic acid. Further, the molecular depression of glycerol has the same constant value in the presence of either acid.

The mutual influence of two electrolytes with a common ion is discussed, and expressions are deduced whereby it is possible to calculate the degree of dissociation of each electrolyte, and thence to calculate the depression of the freezing point which should be observed in a solution containing both electrolytes. These deductions are tested and confirmed by experiments in which the freezing points of solutions containing nitric and *o*-nitrobenzoic acids have been determined.

J. C. P.

Experimental Law of Electric Transport of Dissolved Salts. AUGUSTE PONSOT (*Compt. rend.*, 1904, **138**, 192—194).—From theoretical considerations based on Chassy's work on "A New Electric Transport of Dissolved Salts" (*Thèse de Doctorat*, 1890), the author deduces the two laws: (1) When in a mixture of salts of the same acid one salt only is electrolysed, the total number of molecules transported depends only on the nature and concentration of this salt, and is independent of the presence and concentration of the non-electrolysed salts. (2) When two salts are electrolysed, the total number of molecules transported depends on the nature, the concentration, and the fraction of the equivalent electrolysed of each of them; it is independent of the salts of the same acid which are not electrolysed.

M. A. W.

Chemical Reactions at Very High Temperatures. CONSTANTIN ZENGELIS (*Zeit. physikal. Chem.*, 1903, **46**, 287—292).—The author shows that by the combustion of aluminium powder in a current of oxygen it is possible to reach temperatures comparable with that of the electric furnace. Thus he has been able to produce aluminium nitride and carbide, and to vaporise platinum, magnesia, and lime.

J. C. P.

Specific Heats of Aqueous Solutions. G. KALIKINSKY (*J. Russ. Phys. Chem. Soc.*, 1903, **35**, 1215—1238).—The author gives first of all an account of previous investigations on the specific heat of aqueous solutions, and then describes his own calculation, made with the view of discovering a connection between the molecular weight of a substance in solution and the specific heat of the solution.

The specific heat of a solution of x parts by weight of a substance in 100 of water may be expressed by the formula:

$$y = 1 - x/(100 + x) + c.x/(100 + x) \mp z.x/(100 + x),$$

where the specific of heat of water is taken as 1, and that of the dissolved substance in the solid state denoted by c, while z represents the magnitude by which the specific heat of the solution is changed (relatively to the mean specific heat) by dissolving 1 gram of the substance in a given quantity of water. When the specific heat of a solution is less than that calculated from the specific heats of its constituent parts, which is the case for the strong mineral acids and bases and their salts, the negative sign in the formula must be taken. The value of z depends on the concentration of the solution and on the nature of the dissolved substance, and may be expressed by the formula: $z = \alpha - \beta . x/(100 + x)$. From the known data for solutions of a number of electrolytes, the values of α and β have been calculated, and also the values of αe (e being the equivalent weight of the substance dissolved), which expresses the diminution of the specific heat of water containing in solution the equivalent weight of any substance; tables are also given containing the observed values of the specific heats of solutions of various concentrations, together with those calculated from the above formula. The values of αe for potassium chloride, bromide, nitrate, sulphate, chromate, and carbonate, sodium chloride, nitrate, sulphate, and carbonate, strontium chloride, barium chloride, magnesium chloride and sulphate, and manganese chloride are all either exactly or very nearly 38; for calcium chloride, 37; for potassium iodide, sodium bromide or iodide, nitric acid, and ammonium sulphate, 36; for ammonium chloride, 34; for strontium nitrate and nickel sulphate, 33; for copper sulphate, 32; for ammonium nitrate, 31; for lead nitrate, taking e as the molecular weight, 38; and for sulphuric acid, taking e as the molecular weight, 22. By substituting the value of z in the above formula, it is seen that β is the coefficient of the term $[x/(100 + x)]^2$, which is very small, so that in general it may be taken that $ez = \alpha e = 38$; equivalent qualities of electrolytes in high degrees of dilution hence diminish the specific heat of the water in which they are dissolved by a constant amount. The values of β also show certain regularities, and for a series of similar compounds, such as KCl, KBr, and KI or $CaCl_2$, $SrCl_2$ and $BaCl_2$, it seems probable that β has the value B/e^2, where B is a constant.

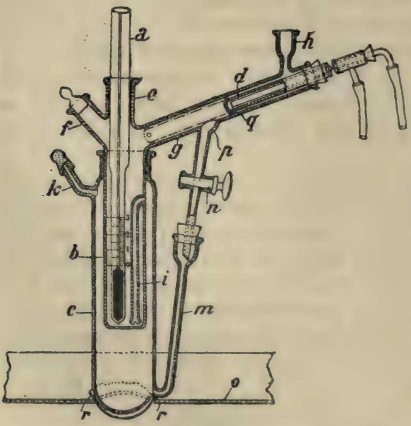
From the results given, it is also seen that for one and the same salt in different concentrations, the value of ez increases with the dilution.

The other substances investigated are the following: (1) Sucrose. In this case, $c = 0{\cdot}301$ and z is practically constant and equal to $0{\cdot}128$, so that the specific heat of the solutions is expressed by $y = 1 - 0{\cdot}571 . x/(100 + x)$. (2) Tartaric acid; $c = 0{\cdot}288$ and z is nearly constant, and $= 0{\cdot}090$, so that $y = 1 - 0{\cdot}622 . x/(100 + x)$. (3) Acetic acid; $c = 0{\cdot}4932$ and z diminishes, though but slightly, on dilution; $y = 1 - 0{\cdot}37 . x/(100 + x)$. T. H. P.

Sublimation Lines of Binary Mixtures. W. Bakhuis Roozeboom (*Proc. K. Akad. Wetensch. Amsterdam*, 1903, 6, 408—410. Compare Abstr., 1902, ii, 490; 1903, ii, 135).—From the consideration of the p, t, x-representation of the equilibria, for solid, liquid, and gaseous phases of binary mixtures, it may be deduced in what manner the evaporation of the mixtures of two solid substances, or, inversely, their condensation on cooling a mixture of vapours, takes place at a constant pressure by a change of temperature. A. McK.

Distillation. Eugène Charabot and Jacques Rocherolles (*Compt. rend.*, 1904, 138, 497—499).—When two non-miscible liquids are distilled by passing the vapour of the more volatile into the less volatile liquid, two cases arise, according as the temperature of the latter liquid is lower or higher than that at which the two liquids would simultaneously boil if heated in the same vessel. In the first case, the vapour of the more volatile would condense in the less volatile liquid and form two liquid layers, a case already considered (compare Abstr., 1902, ii, 552); whilst in the second case no such condensation would occur, the distillation process would be continuous, and the ratio of the weight of the less volatile to that of the more volatile liquid in the distillate is given by the formula $P/P' = M\phi/M'h$, where M and M' are the molecular weights of the two substances, ϕ the vapour pressure of the less volatile liquid at the temperature of the mixed vapours, and h the pressure in the apparatus; the ratio P/P' can be increased (1) by increasing the temperature of the less volatile liquid, or (2) by decreasing the pressure in the apparatus. Experimental values for P/P' obtained with water and oil of turpentine agree closely with those calculated from the ratio $M\phi/M'h$. M. A. W.

Modification of Beckmann's New Boiling Apparatus for Heating in a Current of Vapour. Gustav Walther (*Ber.*, 1904, 37, 78—82).—The apparatus shown in the cut has the advantage over Beckmann's new form (Abstr., 1902, ii, 303) that the parts are detachable; hence it is less liable to fracture and can be constructed more cheaply. The parts are made air-tight during an experiment by the insertion of thin sheets of asbestos paper. The solvent is boiled in the jacket, *c*, the vapour passing through *i* into the boiling tube, *b*, and subsequently into the arm, *q*, where it is condensed; at first the movable condenser, *d*, is in its lowest position (dotted), so that the condensed liquid runs back into *b*. To observe the boiling point and volume, the burner is removed, *k* opened to equalise the pressure, and the thermometer raised completely out of the liquid and its volume read; then the thermometer is put into its original position, *k* closed, the liquid again boiled, and the boiling point observed when constant. As long as the condenser is in its lowest position, liquid



accumulates in *b*; by raising it, the condensed liquid passes back through *n* into the vapour jacket. As long as *n* is open, the burner may be removed without causing the liquid in *b* to flow over into *c*, as the tube *h* is open to the air. W. A. D.

Freezing Point and Boiling Point Experiments in Connection with Molecular Weight Determinations. Ernst Beckmann (*Zeit. physikal. Chem.*, 1903, **46**, 853—866).—It has been found, even after special purification of the material and with the most accurate work, that methylene iodide has two freezing points, 4·0° and 4·7°. It therefore appears that methylene iodide crystallises in two forms, and the author, using solutes of known molecular weight, finds the mean depression constant for the more stable form (m. p. 4·7°) to be 144, whilst that for the other is 137. The molecular weights of sulphur, selenium, phosphorus, and iodine in methylene iodide have been determined, and the values found point to the formulæ S_8, Se_{10}, P_4, I_2 (compare Beckmann, Abstr., 1890, 447; Beckmann and Stock, Abstr., 1895, ii, 382; Beckmann and Pfeiffer, Abstr., 1897, ii, 363; Garelli and Bassani, Abstr., 1901, ii, 541).

The molecular weight of aluminium bromide in bromine determined by the boiling point method is that required by the formula Al_2Br_6. The bromide was prepared directly in the boiling tube, and the value of the elevation constant taken was 52° (arrived at by using tetrabromomethane as solute). Further experiments with stannic bromide, antimony pentabromide, and arsenic tribromide in boiling bromine pointed to the respective formulæ $SnBr_4$, $SbBr_5$, and $AsBr_3$.

J. C. P.

Variation of the Melting Point of Glauber's Salt with Pressure. Gustav Tammann (*Zeit. physikal. Chem.*, 1903, **46**, 818—826).—By finding the temperatures corresponding with certain applied pressures, the author has determined the fusion curve for Glauber's salt. At low pressures, this substance expands on melting, whilst at high pressures it contracts. In accordance with this, the fusion curve exhibits a maximum which is found to be about the pressure 750 kilograms per square centimetre, and a temperature about 0·25° above the ordinary point of fusion of Glauber's salt. There is reason to suppose that the fusion curves of all substances would exhibit maxima if the applied pressures were high enough; the special feature of the fusion curve for Glauber's salt is that the maximum is reached at a comparatively low pressure. The fusion curve, obtained as described, lies above that previously deduced from the volume alterations accompanying fusion. J. C. P.

Molecular Lowering of the Freezing Point of Water Produced by Concentrated Solutions of Certain Electrolytes. Harry C. Jones and Frederick H. Getman (*Zeit. physikal. Chem.*, 1903, **46**, 244—286).—An extension of previous work (see Jones and Chambers, Abstr., 1900, ii, 262; Chambers and Frazer, *ibid.*, ii, 526). An outline of some of the experiments described in detail in this paper has already been published (Abstr., 1902, ii, 489). The electrolytes for which a minimum value of the molecular depression has been found include lithium, ammonium, sodium and potassium chlorides, lithium nitrate, potassium carbonate, phosphoric acid, and sodium hydroxide. No minimum has been found for ammonium nitrate, potassium dihydrogen phosphate, ammonium, sodium, and potassium sulphates, and sodium carbonate; except, however, in the case of ammonium nitrate, it was not possible to examine these salts in very concentrated solution. If the molecular depressions are plotted against the concentrations as abcissæ, the curve for an acid lies in general above the curves for its alkali salts. The molecular boiling point elevation exhibits a similar minimum in many cases, but at higher concentration than the minimum observed for the freezing point depression of the same salt.

There is no evidence of irregularity in the conductivity-concentration curves at the position of the minimum molecular depression, and the refractivity of the solutions, which has been examined in a number of cases, is also perfectly regular. The most satisfactory interpretation of the phenomena referred to is that given by Jones and Chambers (*loc. cit.*). J. C. P.

Cryoscopic Behaviour of Halogen Compounds of the Elements when Dissolved in Phosphorus Oxychloride. GIUSEPPE ODDO and MARIO TEALDI (*Gazzetta*, 1903, 33, ii, 427—449. Compare Abstr., 1901, ii, 492).—A systematic study of the cryoscopic behaviour of the halogen salts of all the more common elements when dissolved in phosphorus oxychloride. The following halogen salts are insoluble in the solvent: the chlorides of lithium, sodium, potassium, copper, silver, calcium, strontium, barium, zinc, cadmium, cobalt, nickel, selenium, tellurium, chromium, and uranium; the bromides of lithium, sodium, potassium, selenium, tellurium, and cadmium; and cadmium and tellurium iodides. The alkaline iodides are decomposed to some extent, iodine being liberated. Some of the salts form compounds with the solvents; these are: $SbCl_5,POCl_3$; $2SnCl_4,POCl_3$; $AlCl_3,POCl_3$; $BBr_3,POCl_3$; $2MgCl_2,POCl_3$. The lower haloids of these elements, which form two halogen derivatives, give, as a rule, normal values for the molecular weight; for example, phosphorus trichloride and tribromide, arsenic trifluoride and tribromide, sulphur chloride and bromide, and iodine chloride. But the higher halogenated compound always undergoes, to a greater or less extent, dissociation into two parts; this behaviour is shown by phosphorus pentachloride and pentabromide, bismuth trichloride and tribromide, sulphur tetrachloride, SCl_4, platinum tetrachloride, ferric chloride, and auric chloride. In some cases, for example, phosphorus pentachloride and pentabromide, bismuth tribromide, and auric chloride, the dissociation into two parts is complete. With the exception of phosphorus pentabromide, all the substances giving abnormal values with phosphorus oxychloride have, in benzene solution, a normal molecular value. It is contended that in phosphorus oxychloride solutions complex ions exist, such, for example, as: $P\overset{+}{C}l_4\cdot$, chlorophosphonium; $B\overset{+}{i}Cl_2\cdot$, chlorobismuthonium; $P\overset{+}{t}Cl_3\cdot$, chloriplatonium. The solutions of PCl_5 and PBr_5 in phosphorus oxychloride are colourless, and therefore do not contain free halogen; this is particularly striking, because in benzene solutions the pentabromide is completely resolved into tribromide and free bromine, which imparts a brown colour to the solution.

Silicon tetrachloride and tetrabromide give normal values for the molecular weight in phosphorus oxychloride. W. A. D.

Molecular Rise of the Critical Temperature. JACOBUS H. VAN'T HOFF (*Chem. Centr.*, 1904, i, 422—423; from *Chem. Weekblad.*, 1, 93—96).—The original paper contains a theoretical discussion of the fact observed by Centnerszwer (this vol., ii, 158) that when molecular quantities of non-volatile substances are dissolved in liquid ammonia or sulphur dioxide, the critical temperature is raised by about the same amount in each case. The molecular rise of the critical temperature was found to be 724 for liquid sulphur dioxide, and 219 for ammonia. It is shown that considerations based on the osmotic pressure of the dissolved substance lead to the conclusion that the relative molecular rise of the critical temperature is proportional to the molecular weight of the solvent. According to Deprez and Trouton's rule, the law of the molecular rise of the boiling point must obtain more exactly for coincident temperatures than for the boiling points themselves.

E. W. W.

Theory of the Critical State. Difference between Gasogenic and Liquidogenic Substances. ISIDOR TRAUBE (*Zeit. anorg. Chem.*, 1904, 38, 399—409. Compare Abstr., 1902, ii, 551; this vol., ii, 110). —A further exposition of the author's theory as to the discontinuity of the gaseous and liquid state at the critical temperature. Further experiments are described in support of the views expressed.

A. McK.

Duhem's "Regnault Law." JAN VON ZAWIDZKI (*Zeit. physikal. Chem.*, 1903, 46, 21—29).—The extension of the "Regnault Law" to homogeneous binary liquid systems has led Duhem to propose for these a fifth general type of vapour pressure curve. The experimental evidence for this type is examined by the author and found to be quite inadequate. He shows that in the system ether—water, the three-phase and two-phase pressures (compare Kuenen and Robson, Abstr., 1899, ii, 356) are in general different from the vapour pressure of pure ether. He shows also that, contrary to the observations of Holley (Abstr., 1902, ii, 443), vapour pressure curves for mixtures of propyl alcohol and amyl iodide exhibit maxima. J. C. P.

Vapour Pressure of Solid Solutions. ALEXANDER W. SPERANSKI (*Zeit. physikal. Chem.*, 1903, 46, 70—78).—The author describes a modified form of the Bremer-Frowein tensimeter, with which he has determined the vapour pressure of solid solutions of β-naphthol in naphthalene at various temperatures from 60° to 85°. The higher the percentage of β-naphthol the lower is the vapour pressure of the solid solution, and the author, applying the rules that are valid for liquid solutions, has calculated the molecular weight of β-naphthol from the lowering of the vapour pressure, the very slight tension of the β-naphthol itself being negligible. The values of the molecular weight found are, for example, 198 for a solution containing 14·6 molecular per cent. of β-naphthol, and 255 for one containing 33·6 molecular per cent. These values lie between the single and double molecular weight of β-naphthol (compare Küster, Abstr., 1895, ii, 439). J. C. P.

Pressure and Composition of the Vapours of Solutions in Aqueous Alcohol. Iwan A. Kablukoff, A. Solomonoff, and A. Galine (*Zeit. physikal. Chem.*, 1903, 46, 399—407. Compare Kablukoff, Abstr., 1893, ii, 154; Wrewsky, Abstr., 1901, ii, 56).—The effect of dissolving sodium and potassium chlorides, bromides, and iodides, and dextrose in aqueous alcohol containing from 10—46 per cent. of alcohol is to increase the vapour pressure of the aqueous alcohol. The increase varies with the nature of the dissolved salt, but for a given salt is approximately proportional to the concentration of the latter. There is apparently a connection between the increase of vapour pressure produced by the salts and their solubility in alcohol and water. Thus, at 47·5°, the molecular increase of vapour pressure produced by sodium chloride is equal to that produced by potassium chloride, and lies between 8 and 13 mm. of mercury, according to the concentration of the alcohol. Salts which are notably more soluble in alcohol than these chlorides as, for example, potassium bromide and iodide, cause a smaller molecular increase of vapour pressure. Tartaric acid, which is very soluble both in water and in alcohol, scarcely affects the vapour pressure of aqueous alcohol, whilst mercuric chloride, which is more soluble in alcohol than in water, actually lowers the vapour pressure.

The change of vapour pressure produced by electrolytes is greater than that produced by non-electrolytes, for dextrose (the solubility of which in alcohol is comparable with that of sodium and potassium chlorides) gives a molecular increase of vapour pressure of about 6 mm.

When sodium chloride, potassium chloride, bromide and iodide are dissolved in aqueous alcohol, the percentage of alcohol in the vapour is raised; when tartaric acid is the solute, the composition of the vapour is not affected; when mercuric chloride is the solute, the percentage of alcohol in the vapour falls. The extent by which the percentage of alcohol in the vapour is increased by the solution of sodium chloride, &c., is proportional to the salt concentration. The extent of the increase is the same for sodium and potassium chlorides, and rather less for potassium bromide and iodide.

These results are attributed to the effect of the dissolved substance on the alcohol-water complexes that are supposed to exist in aqueous alcohol. If the added salt has a strong affinity for the water molecules, it will tend to break up the alcohol-water complexes, and the alcohol molecules thus set free will go to increase the vapour pressure of the solution. J. C. P.

Advantage of Hydrogen as Unit of Comparison in Determining the Specific Gravity of Gases. ALEXANDER P. LIDOFF (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 1245—1246).—The author's reasons for displacing air by hydrogen as a standard in gaseous specific gravity determinations are: (1) hydrogen has a much smaller sp. gr. than air, so that the differences between the sp. grs. of different gases are more striking than where air is taken as standard. (2) Air is not an element, but a complex mixture of gases, and investigations by the author show that the proportion of nitrogen in the inert portion of the air varies by as much as 8 per cent.

T. H. P.

New Gravimetric Method of Determining the Specific Gravity of Gases. ALEXANDER P. LIDOFF (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 1239—1245).—The method here described for determining the sp. gr. of gases is based on the absorption of many gases by heated magnesium or manganese (this vol., ii, 250); the volume of gas absorbed is measured by ordinary gasometric apparatus, and the increase in weight of the absorbing metal is also determined. With cyanogen (manganese) and with atmospheric and chemical nitrogen, carbon dioxide, nitrous oxide, sulphur dioxide, and ammonia (magnesium) the method gives good results. A sketch of the apparatus used is given. T. H. P.

Resistance of Glass Tubing to Bursting Pressure. WALTER P. BRADLEY and A. W. BROWNE (*J. Physical Chem.*, 1904, 8, 37—55).—The bursting pressure of a large number of samples of different kinds of glass was determined. As the bursting pressure is found in general to vary directly as the thickness of the wall and inversely as the bore, the values for PB/W were compared, where P is bursting pressure, B the bore, and W the thickness. The results show that Jena glass and soft glass have the highest values, Bohemian glass the lowest. Lead glass, besides possessing a high bursting pressure, is very trustworthy, the most erratic tube examined being only 15 per cent. below the normal strength. The strength of tubes depends greatly on their previous history, thus a sample once tested to about 100 atmospheres would not withstand as much again, but would probably burst at very low pressures. L. M. J.

Viscosity of Solutions. JULIUS WAGNER [with JOHANNES MÜHLENBEIN] (*Zeit. physikal. Chem.*, 1903, 46, 867—877).—In comparing the viscosities of different metals in solutions of their salts, the author has previously (Abstr., 1890, 441) shown that for allied metals the viscosity decreases as the atomic weight increases. It is now shown, however, that the weights of water per litre of the normal solutions of chlorides, nitrates, or sulphates of the metals vary in a very similar manner, and it is therefore doubtful whether there is any direct relation between the viscosity of the metals and the periodic law.

Euler's explanation of negative viscosity is discounted by Mühlenbein's measurements, showing that in non-electrolytic cases also the viscosity of the solvent may be lowered by the solute, even when the viscosity of the solute itself is higher than that of the solvent. Examples of this diminished viscosity are: cyanobenzene, nitromethane, and allylthiocarbimide in ethyl alcohol, nitrobenzene and cyanobenzene in *iso*butyl alcohol. The viscosity of solutions of the nitrotoluenes in ethyl alcohol varies with the concentration in a peculiar manner; with *o*-nitrotoluene, there is an inversion point; with *m*-nitrotoluene, there is a minimum, with *p*-nitrotoluene, a maximum. In the author's view, a solute diminishes the quantity of solvent in a given space, and this leads to a diminution of the viscosity, which diminution, however, may be partly or more than made good by the solute itself. According to the relative magnitude of the various factors, the viscosity of the solvent may be increased or diminished.

J. C. P.

Osmose. Auguste Ponsot (*Compt. rend.*, 1904, **138**, 356—358. Compare Guillemin, this vol., ii, 161).—A claim for priority (compare Abstr., 1896, ii, 411, 626; 1898, ii, 16, 471). From theoretical considerations, the author deduces the following relation: two solutions which at the same temperature have the same vapour pressure, or are in osmotic equilibrium, have the same osmotic pressure only when they are both under the same pressure P. M. A. W.

Solubility and Diffusion in Solution of Dissociated Gases. Owen W. Richardson (*Phil. Mag.*, 1904, [vi], 7, 266—274).—A mathematical paper in which equations for solubility and rate of diffusion are deduced; the first is very simply obtained and is interesting, namely, $a^n/A = k_o/k_i$, where n is the number of similar products of dissociation, a and A are the respective solubilities, and k_o, k_i are the dissociation constants outside and inside the solution. An expression for the variation of solubility with temperature is obtained dependent solely on the difference of the heats of solution of the dissociated and undissociated gas. The expression for the diffusion becomes somewhat complicated, involving two terms, one of which is proportional to the pressure and the other to its nth root. L. M. J.

Theory of Capillarity and Colloidal Solutions. Frederick G. Donnan (*Zeit. physikal. Chem.*, 1903, **46**, 197—212. Compare Abstr., 1901, ii, 439).—From the point of view of the Laplace-Gauss theory of capillary forces, the physical possibility of negative interfacial tension is considered, and the results to which it would give rise under specified conditions. In certain cases, the theory points to the production of extremely fine-grained heterogeneous mixtures, such as actually occur in colloidal solutions. Such two-phase systems may be due to the interaction of capillary forces in the manner indicated in the paper.

J. C. P.

Capillarity Constants and Specific Weights of Salts at their Melting Points. Method for Capillary Solubility Determination. S. Motylewski (*Zeit. anorg. Chem.*, 1904, **38**, 410—418).—The capillarity constants of a number of fused salts have been determined by Traube's method. Determinations of the specific gravity of various salts at their respective melting points were also made, and a table is quoted showing the value for γ, the capillarity constant, for α^2, where $\alpha^2 = 2\gamma/d$ (d = density), for the molecular volume and for the molecular surface energy $\alpha(m/d)^{\frac{2}{3}}$ of the individual salts. Solubility determinations, made by the capillary method, showed that water at 15° dissolves 0·33 per cent. of normal heptyl alcohol and 0·087 per cent. of normal octyl alcohol. A. McK.

Constitution of Solutions of Salts. Richard Abegg and St. Labendzinski (*Zeit. Elektrochem.*, 1904, **10**, 77—81).—The ratios of the concentrations of the simple metallic ions in the solutions are measured by means of the potential differences between the solutions and the metals. These numbers are compared with the total concentrations of the ions in the same solutions, calculated from the conductivity. The nitrates, sulphates, chlorides, and acetates of zinc, cadmium, nickel, cobalt, iron, lead, and copper are examined; all the salts form complex ions (the number of simple metallic ions is very much smaller than the total number calculated from the conductivity). The nitrates form very few complex ions, the chlorides, sulphates, and acetates form more in the order given. The addition of an alkali salt of the same anion increases the concentration of the complex ions, the effect increasing from nitrate to acetate. This points to the complex ions being anions. When a solution of the acetates of an alkali metal and a heavy metal is diluted, the complex anions break up so rapidly that the concentration of the simple metallic ions in the dilute solutions may be greater than that in the more concentrated solution. This is also the case with cadmium chloride. If the concentration of the anion is kept constant and the salt of the heavy metal diluted, the small concentration of the simple metallic ions is approximately proportional to the total concentration of the salt. T. E.

Researches on the Solubility of Sparingly Soluble Salts. Wilhelm Böttger (*Zeit. physikal. Chem.*, 1903, **46**, 521—619).—The author has found the solubility of a large number of sparingly soluble salts by determining the conductivity of water (1) when pure, (2) after saturating with the salt under examination. From this increase in conductivity due to the dissolved salt, its solubility can be calculated (compare, for the use of this method, Holleman, Abstr., 1893, ii, 519; Kohlrausch and Rose, Abstr., 1894, ii, 7; Kohlrausch and Dolezalek, Abstr., 1902, ii, 72; Kohlrausch, Abstr., 1903, ii, 528). Full details are given of the apparatus used, of the precautions adopted, and of the method of calculation employed, but for these the original paper must be consulted.

The numbers in the following table give for the respective salts the weight in grams per litre of saturated solution at 20°:

	Silver.	Thallium.	Lead.
Chloride ……	$1·53 \times 10^{-3}$	$3·26 \times 10^{-2}$	$9·61 \times 10^{-1}$
Bromide ……	$0·84 \times 10^{-4}$	$0·48 \times 10^{-2}$	$8·34 \times 10^{-1}$
Iodide ……	—	$0·64 \times 10^{-1}$	$0·47 \times 10^{-1}$

	Silver.	Thallium.	Lead.
Cyanide ……	$2·2 \times 10^{-4}$	—	—
Thiocyanate..	$1·4 \times 10^{-4}$	$3·15 \times 10^{-1}$	$4·50 \times 10^{-1}$
Bromate ……	$1·59 \times 10^{-4}$	$3·46 \times 10^{-1}$	$13·37 \times 10^{-1}$
Iodate ………	$4·35 \times 10^{-2}$	$0·58 \times 10^{-1}$	$1·83 \times 10^{-2}$
Oxalate ……	$3·65 \times 10^{-2}$	$15·77 \times 10^{-1}$	$1·80 \times 10^{-3}$
Phosphate …	$0·64 \times 10^{-2}$	—	$1·35 \times 10^{-4}$
Carbonate …	—	—	$1·5 \times 10^{-3}$
Sulphate ……	—	—	$4·23 \times 10^{-}$
Sulphide ……	—	$0·21 \times 10^{-1}$	—
Oxide ………	$2·14 \times 10^{-2}$	—	$1·71 \times 10^{-2}$

The numbers given for lead carbonate and oxide are only approximate. The solubility of calcium sulphate also was determined in the same way and found to be 2·04—that is, grams of calcium sulphate per litre of saturated solution.

The influence of the size of the particles on the solubility of a substance could be detected, but was not greater than 1—2 per cent. in the cases where this factor was specially considered. J. C. P.

'Frost Curves' ['Reifkurven']. WILHELM MEYERHOFFER (*Zeit. physikal. Chem.*, 1903, **46**, 379—398. Compare Duhem, Abstr., 1901, ii, 227).—The author extends Duhem's theory of 'dew curves' ('Taukurven') to the case of solid substances. The 'frost curves' represent the variation of pressure and composition of the vapour in equilibrium with a mixture of two solids. According as these remain uncombined, or form double salts or mixed crystals, various types of curve are obtained (compare Roozeboom, Abstr., 1901, ii, 151). J. C. P.

Crystallisation in Binary Systems. WILDER D. BANCROFT (*Zeit. physikal. Chem.*, 1903, **46**, 87—88).—A graphical method is described whereby from the freezing point curve for a binary system it is possible to determine the nature and relative amounts of the phases formed in solidification, provided no solid solutions occur.

J. C. P.

Inclusion and Occlusion of Solvent by Crystals. THEODORE W. RICHARDS (*Zeit. physikal. Chem.*, 1903, **46**, 189—196).—As shown by experiments with barium chloride, the amount of moisture mechanically held by a crystalline salt diminishes with pulverisation and subsequent exposure. When, however, the particles are very small, the surface adsorption becomes marked, and the author therefore holds that hydrated salts, in the case of which application of heat is not permissible, cannot be accurately weighed according to any usual procedure. In the case of anhydrous salts, the removal of the included moisture requires the disintegration of the cell walls by mechanical, thermal, or chemical processes. It is suggested that the impurities enclosed in natural minerals might often be used as a clue to the manner of their growth, and to the mechanism of geophysical processes. J. C. P.

Complexes of Two Colloids: (I) of the Same Electrical Sign; (II) of Opposite Electrical Sign. Victor Henri, S. Lalou, André Mayer, and G. Stodel (*Compt. rend. Soc. Biol.*, 1903, 55, 1669—1671; 1671—1673).—A mixture of two colloids of the same electrical sign, one of which is easily, the other with difficulty, precipitated by electrolytes (for example, silver and starch), can be precipitated no more easily than the more stable of the two components. The stability of the complex increases at first more slowly than the quantity of stable colloid added, but after a certain point becomes very great. The quantity of a stable colloid that must be added to an unstable colloid to give a stable complex increases with the quantity of unstable colloid.

The addition of a certain quantity of a negative colloid (for example, ferric hydroxide) to a positive colloid (for example, silver) precipitates both substances. It is possible, however, to have too little or too much of the negative colloid, and to get no precipitation, so that there is a critical point for such a colloid complex. If to an unstable colloid gradually increasing quantities of a colloid of the opposite electrical sign are added, the stability of the complex first diminishes, reaches a minimum, and then increases. The minimum corresponds with the critical point just referred to. The properties of the complex are not the same on the two sides of this minimum. Where the positive colloid predominates, the complex is precipitable by acidic ions; where the negative colloid predominates, by metallic ions. So generally, in an electric field, the complex moves in the same direction as the predominant component. J. C. P.

Changes produced in Colloids by Coagulation. Jacques Duclaux (*Compt. rend.*, 1904, 138, 571—572).—When a solution of a colloid is coagulated, the precipitate which is formed usually contains a certain amount of one of the radicles of the salt used to produce coagulation. It is shown that this change in the composition of the colloid is brought about by simple substitution of one of its radicles for an equivalent amount of one of the constituents of the salt. The solution, after coagulation, will contain a small amount of the radicle displaced from the colloid; the author proposes to make use of this fact in the investigation of the composition of complex organic colloids.

S. S.

Chemical Equilibrium. Leo Pissarjewsky (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 1204—1215).—The author has studied the reaction between silver and ferrous sulphates, and from the results obtained draws the following conclusions: (1) the reaction between Ag_2SO_4 and $FeSO_4$ reaches a state of equilibrium after 168 hours; the initial high velocity of the reaction diminishes extremely rapidly during the first 50 hours. (2) The constant of the equilibrium $Ag^{\cdot} + Fe^{\cdot\cdot} \rightleftarrows Ag + Fe^{\cdot\cdot\cdot}$ at 25° equals 0·00792 and the diminution of free energy +2870 cals. (3) The heating effect of the reaction (diminution of total energy) is +8683 cals. (4) Calculating by means of van't Hoff's formula, the constant becomes 1, and the diminution of free energy zero, at −48·7°. (5) If the reaction takes place in normal sodium sulphate solution, the constant at 25° is 0·00326 and the diminution of free energy + 3397 cals. (6) The determination of the constant is only possible at temperatures below 35°, because at that temperature basic iron salts separate from the solution, and these exert an influence on the magnitude of the constant. T. H. P.

Densities of Fused Salts and the Chemical Equilibrium of their Mixtures. Erich Brunner (*Zeit. anorg. Chem.*, 1904, **38**, 350—375).—Ostwald has endeavoured to determine equilibria of reciprocal salt pairs by calorimetric methods. The author endeavours to solve the same problem by volumetric methods.

Various salts were fused in an electric furnace and the densities of the fused masses determined. The following values were obtained: potassium chloride, 1·450 – 0·00057 (t – 900); potassium bromide, 1·991 – 0·00080 (t – 900); potassium carbonate, 1·900 – 0·00046 (t – 900); potassium sulphate, 1·96 – 0·0005 (t – 900); sodium chloride, 1·500 – 0·00054 (t – 900); sodium bromide, 2·2125 – 0·00080 (t – 900); sodium carbonate, 1·9445 – 0·00040 (t – 900); sodium sulphate, 2·065 – 0·00045 (t – 900); lithium chloride, 1·375 – 0·00043 (t – 900); lithium bromide, 2·30 – 0·0007 (t – 900); lithium carbonate, 1·765 – 0·00034 (t – 900); lithium sulphate, 1·981 – 0·00039 (t – 900).

The density of fused sodium chloride was controlled by a dilatometric method, but the value obtained for potassium bromide was abnormal.

The following conditions of equilibria were determined: At 900°, 52 per cent. of $(KCl + \frac{1}{2}Na_2CO_3) \rightleftharpoons$ 48 per cent. of $(NaCl + \frac{1}{2}K_2CO_3)$, 63 per cent. of $(KCl + \frac{1}{2}Li_2CO_3) \rightleftharpoons$ 37 per cent. of $(LiCl + \frac{1}{2}K_2CO_3)$, 53 per cent. of $(KBr + \frac{1}{2}Na_2CO_3) \rightleftharpoons$ 47 per cent. of $(NaBr + \frac{1}{2}K_2CO_3)$, 56 per cent. of $(NaCl + \frac{1}{2}Li_2CO_3) \rightleftharpoons$ 44 per cent. of $(LiCl + \frac{1}{2}Na_2CO_3)$, 60 per cent. of $(NaCl + \frac{1}{2}Li_2SO_4) \rightleftharpoons$ 40 per cent. of $(LiCl + \frac{1}{2}Na_2SO_4)$. A. McK.

The Conditions of the Indifferent State. E. Ariès (*Compt. rend.*, 1904, **138**, 416—419).—It is shown from theoretical considerations that the indifferent point can be attained whatever be the number of phases in the system. This is proved in three cases: (1) when the number of phases exceeds the number of constituents in the system by units, (2) when the number of phases and constituents are equal, (3) when the number of phases is less than that of the constituents by units. S. S.

Classification and Theory of Coupled Oxidation and Reduction Processes. Robert Luther and Nikolai Schiloff (*Zeit. physikal. Chem.*, 1903, **46**, 777—817. Compare Schiloff, Abstr., 1903, ii, 276).—The processes considered are those in which three substances, A, B and C, take part, the discussion being further limited by the condition that whilst A and B react readily, A and C hardly react at all, except when B is present. In such cases, A is to be regarded as actor, B as inductor, and C as acceptor (see Schiloff, *loc. cit.*). Two possible explanations of such coupled reactions are suggested: (1) the reaction between actor and acceptor may be catalytically accelerated by the inductor, which, however, is at the same time being gradually transformed by the actor into a catalytically inactive substance: in short, a catalytic action during which the catalytic agent is itself being removed. (2) The inductor may form with the actor or acceptor or with both an intermediate product, the action of which results in the change of all three original substances. Which of these two explanations is to be adopted in a particular case will have to be deduced from the way in which the induction factor (see Schiloff, *loc. cit.*) varies with the concentration of the reacting substances.

A systematic variation of the reacting substances themselves will show which of them plays a specific part in the reaction, and a classification of coupled reactions may be made according as the term "specific" has to be applied to one or to two of the three reacting substances. I. Where only one is specific, that one may be (*a*) the inductor, (*b*) the actor, (*c*) the acceptor. Examples of (*a*) are found in the numerous reactions where a ferrous salt acts as inductor (compare Manchot, Abstr., 1900, ii, 546; 1901, ii, 549; 1903, ii, 151, 152). In such reactions, the inductor itself forms an intermediate product and must therefore be a substance capable of several stages of oxidation. With the same inductor, the chemical character of the actor and acceptor may be varied within wide limits. Examples of (*b*) are the cases where bromic acid is the actor (see Schiloff, *loc. cit.*). No example of (*c*) is known. II. Where two of the reacting substances are to be regarded as specific and form complexes, these two may be (*a*) acceptor and inductor, (*b*) actor and acceptor, or actor and inductor. An example of (*a*) is found in the reaction between chromic or permanganic acid (actor), arsenious acid (inductor), and tartaric acid (acceptor) (Schiloff, *loc. cit.*), or in that between permanganic acid, ferrous oxide, and chlorine ions (Wagner, Abstr., 1899, ii, 275). In case (*b*) the intermediate complex must be a combination of oxidising and reducing agents. Cases of the intensification of oxygen ('Sauerstoffactivierung') come under this head. J. C. P.

Heterogeneous Catalytic Reactions. I. Catalysis of Oxyhydrogen Gas by Platinum. MAX BODENSTEIN (*Zeit. physikal. Chem.*, 1903, **46**, 725—776. Compare Abstr., 1899, ii, 733).—The catalytic combination of oxygen and hydrogen in presence of compact platinum proceeds rapidly at the ordinary temperature, and the velocity of combination has been determined by measuring at intervals the pressure of the system at constant volume; the decrease of pressure observed is a measure of the water vapour formed.

When the platinum has the same temperature as the surrounding gas, a film of water is deposited on its surface. In these circumstances, the reaction is found to be approximately of the first order, the velocity coefficient increasing slightly with the time when the gases are mixed in equivalent proportion or when the hydrogen is in excess, but decreasing with the time when the oxygen is in excess. The temperature coefficient of the velocity is very much smaller than is usual in chemical reactions, and this observation bears out the view that what is actually measured is the velocity of a physical process, in fact, the rate of solution of oxygen (or of hydrogen, when the gas contains excess of oxygen) in the film of water deposited on the platinum, the actual combination of the gases at or in the platinum taking place with a nearly infinite velocity (compare Ernst, Abstr., 1901, ii, 495).

When the surface of the platinum is kept dry by making it warmer than its surroundings, the rate of combination is much greater than in the previous case, but does not conform even approximately to the course of a unimolecular reaction. The increase of the velocity coefficient calculated for a unimolecular reaction amounts to 100 per cent. or over for nine-tenths of the total possible change, and this is the case whether hydrogen or oxygen is in excess. As in the experiments with moist platinum, the temperature coefficient of the velocity is very small, and the view is adopted that what is actually measured is the rate of absorption of oxygen by the platinum, the subsequent combination of the gases in the platinum being a very rapid process. That the course of the change deviates so much from that of a unimolecular reaction is probably due to the disturbance caused by currents of water vapour escaping from the platinum; this would explain the lower values of the velocity coefficient, obtained in the earlier stages of the reaction, when the quantity of escaping water vapour is specially large. In harmony with this explanation, it has been found that the rate of action, which is but slightly affected by altering concentration or temperature, may be diminished by a "poison," such as iodine, and that the course of combination then approaches more and more to that of a unimolecular reaction.

These experiments, therefore, throw no light on the real nature of the catalytic acceleration due to platinum, for the actual combination of oxygen and hydrogen thus induced proceeds with too high a velocity to be susceptible of accurate quantitative measurement.

J. C. P.

Decomposition of Antimony Hydride as an Example of a Heterogeneous Catalytic Reaction. ALFRED STOCK and OSKAR GUTTMANN (*Ber.*, 1904, **37**, 901—915).—The curve representing the relationship between the percentage of gaseous antimony hydride decomposed and the time varies considerably with the surface of the glass vessel in which the gas is kept. With a clean, smooth surface, the curve has an S-shape; a vessel, the inner surface of which had been etched with hydrofluoric acid, gave a curve slightly S-shaped, and a vessel coated with antimony, first by warming and then at the ordinary temperature, gave a curve of hyperbolic form. The deposited antimony accelerates the decomposition, but the deposit loses this property to a considerable extent after some time. Microscopic study has shown that the different effects obtained with antimony deposited in the cold and at higher temperatures correspond with differences in the physical states (for example, the crystalline nature) of the deposits.

Van't Hoff's equation, $K = 1/t.\log P_0/(3P_0 - 2P_t)$ does not hold good. Better concordance is obtained by using the equation

$$V = 2(x_1 - x_2)/(x_1 + x_2)(t_2 - t_1),$$

where V is the amount of hydride decomposed in unit time (1 hour) calculated on the mean of the amounts present at the beginning and end of the time. In calculating x, attention must be paid to the fact that the hydride does not closely follow Boyle's law on account of the considerable molecular attraction; at 15° and 760 mm. the deviation amounts to 16 mm. This is allowed for in the tables given.

It is considered probable that the reaction takes place at the surface of the antimony instantaneously and that what is measured are the diffusion phenomena. Bodenstein's views (preceding abstract) are supported. J. J. S.

Influence of Persulphates on the Catalytic Decomposition of Hydrogen Peroxide by means of Colloidal Platinum. T. SLATER PRICE and A. D. DENNING (*Zeit. physikal. Chem.*, 1903, **46**, 89—102).—The decomposition of hydrogen peroxide by colloidal platinum is accelerated by adding potassium persulphate, and the acceleration is probably proportional to the amount of persulphate added. The effect of the persulphate is mainly catalytic, for it undergoes only slight decomposition itself. The decomposition of hydrogen peroxide is accelerated also by free persulphuric acid, but the latter is itself decomposed, probably by interaction with the hydrogen peroxide, thus: $H_2O_2 + H_2S_2O_8 = 2H_2SO_4 + O_2$. J. C. P.

Catalytic Oxidation of Organic Substances with Concentrated Sulphuric Acid. I. Chemical Kinetics of the Kjeldahl Analysis and of the Naphthalene Oxidation Process. GEORG BREDIG and JOHN WESLEY BROWN (*Zeit. physikal. Chem.*, 1903, **46**, 502—520).—The authors have followed the gradual oxidation of aniline sulphate and naphthalene in hot concentrated sulphuric acid (with and without catalytic accelerators) by determining at intervals the amount of gas evolved from the reaction mixture. With a thermo-regulator, the temperature of the paraffin bath used could be kept constant within 0·5°, and it was shown that the courses of parallel experiments with the same amount of reagents were coincident. Analysis of the gases evolved in the oxidation of aniline showed that the ratio CO_2/SO_2 (by weight) was 0·31, whilst according to the equation, $(C_6H_5,NH_2)_2,H_2SO_4 + 28H_2SO_4 = (NH_4)_2SO_4 + 28SO_2 + 12CO_2 + 32H_2O$, it should be 0·29. On the assumption that the oxidation of naphthalene goes only as far as phthalic acid, thus: $C_{10}H_8 + 9H_2SO_4 = C_6H_4(CO_2H)_2 + 9SO_2 + 2CO_2 + 10H_2O$, the ratio CO_2/SO_2 (by volume) should be 0·22, whilst analysis gave values between 0·15 and 0·19.

Both reactions are subject to disturbing elements, but are approximately of the first order, and the influence of catalytic agents, notably mercury and copper sulphates, is very evident in the values of the constants obtained. The accelerating influence of these catalysts is nearly proportional to their concentration. Copper is, relatively to mercury, less effective in the oxidation of naphthalene than in the oxidation of aniline. The accelerating effect of copper and mercury together is greater than the sum of their separate effects. The presence of small quantities of water does not appreciably affect the velocity of oxidation. Potassium sulphate and phosphoric oxide do not act in either oxidation as catalytic agents, but merely make it possible to work at higher temperatures. The temperature-coefficient of the reaction velocity between 200° and 300° (with or without catalysts) is of the same magnitude as in other reactions. J. C. P.

Decomposition-tension of Salts and their Anti-fermentative Properties. Hugh McGuigan (*Amer. J. Physiol.*, 1904, 10, 444—451).—The minimum amount of salts, bases, and acids required to inhibit the action of malt diastase was determined. In different salts of the same acids, the inhibitory power varies inversely with the solution tension of the cathion. The action of the cathion appears to be determined by the ease with which it gives up its positive charge. In different salts of the same metal, the power varies inversely with the solution-tension of the anions. The inhibitory power of the cathions is also inversely proportional to the heat of ionisation; that of any salt is inversely proportional to the sum of the solution-tensions of its ions, or to the decomposition tension of the salt. W. D. H.

Shaking and Stirring Apparatus. Julius W. Bruhl (*Ber.*, 1904, 37, 918—924).—A stirrer is described which can be used for flasks fitted with reflux condensers, a paraffin oil or mercury trap being employed.

The shaking apparatus consists of a flat tambourine shaped brass case fixed eccentrically to a grooved wooden disc, which is driven by a small motor. A movable brass ring is fixed around the periphery of the brass tambourine, and to this ring the vessels to be shaken are attached by means of metallic rings. The vessels attached to these rings by the aid of cord may be fitted with reflux condensers and even dropping funnels. The apparatus is of great use in the preparation of organo-magnesium compounds. J. J. S.

Inorganic Chemistry.

Action of Ozone on Hydrogen. George Pickel (*Zeit. anorg. Chem.*, 1904, 38, 307—310).—Ozone acts on hydrogen at temperatures below 100°, and the union of the active oxygen with hydrogen takes place with greater rapidity than the transformation into ordinary oxygen.

Sulphuric acid of sp. gr. 1·18 was electrolysed with a current of about 0·9 ampere and 3—7 volts, the electrodes being made of lead. The gaseous mixture was then dried and passed into a paraffin or air-bath, regulated at the desired temperature, and the quantity of water formed was weighed. The experiments were conducted mainly at temperatures above 150°. In some experiments, the ozone was estimated by titration with potassium iodide. A. McK.

Limits of Stability of Hydrogen Peroxide. WALTHER NERNST (*Zeit. physikal. Chem.*, 1903, **46**, 720—724).—Hydrogen peroxide is an endothermic compound, and therefore its equilibrium concentration in the reaction $2H_2O_2 = 2H_2O + O_2$ should increase as the temperature rises. From the formula $q = RT^2(d\log K)/dT$, the author estimates as follows the amount of hydrogen peroxide which at certain given temperatures should coexist with water vapour and oxygen at a pressure of 0·1 atmosphere.

T …………………	2784°	2154°	1493°	1140°	923°
Per cent. H_2O_2……	0·66	0·24	0·028	0·0032	0 00036

J. C. P.

Generator for the Continuous Preparation of Gases on a Large Scale in the Laboratory. RESTON STEVENSON and W. MCKIM MARRIOTTE (*J. Amer. Chem. Soc.*, 1904, **26**, 64—66).—A method is described for producing a continuous evolution of hydrogen chloride by the contact of streams of hot strong sulphuric acid and concentrated hydrochloric acid in a glass tower filled with glass beads. For details of the apparatus, the description and diagram in the original must be consulted. E. G.

Electrolysis of Chloric Acid and Chlorates. ANDRÉ BROCHET (*Compt. rend.*, 1904, **138**, 200—203. Compare Abstr., 1903, ii, 210, 352).—When a solution of barium, sodium or copper chlorate is electrolysed with a copper anode, the quantity of copper that dissolves is greater than that deposited on the cathode of a voltameter; this is due to the fact that part of the copper enters into solution in the form of a cuprous salt which is subsequently oxidised. The formation of the cuprous salt was detected by an examination of (1) the action of chloric acid and copper chloride on copper, (2) their behaviour on electrolysis with a copper anode. The cuprous salts formed are decomposed by the copper chlorate or chloric acid present with the formation of cupric chloride and hydroxide; the latter in an acid medium passes into solution, and in the case of a copper chlorate solution forms the basic salt, $CuCl_2,3Cu(OH)_2$, in which the Cl_2 is in part replaced by ClO_3. In the case of an alkali chlorate or alkali earth chlorate solution, the base formed at the cathode partly decomposes the basic salt, the oxide so produced being partly reduced by the hydrogen produced at the cathode. M. A. W.

Electrolytic Formation of Periodic Acid and its Salts. ERICH MÜLLER (*Zeit. Elektrochem.*, 1904, **10**, 49—68).—Potassium periodate can be prepared electrolytically without the use of a porous diaphragm by electrolysing a saturated solution of potassium iodate in normal potassium hydroxide containing 0·1 per cent. of potassium chromate with a current density of 0·05 ampere per sq. cm. at the platinum foil anode and a platinum wire cathode. The investigation published with Friedberger (Abstr., 1902, ii, 556) is continued, with the following results. The fact that much better yields of periodate are obtained at platinum cathodes in alkaline solutions than in neutral or acid solutions is probably due to the higher values of the anodic polarisation of platinum in alkaline solutions. The diminished yields at higher temperatures are ascribed to smaller anodic polarisation. Increase of yield as the electrolysis is prolonged goes along with a rise of anodic polarisation. The good yields at a lead peroxide anode cannot be ascribed to a large value of the anodic polarisation (which is about the same as that found with platinum); they are probably due to a catalytic acceleration of the oxidation.

At platinum anodes, no periodate is formed from a neutral solution of potassium iodate; in presence of Cl, SO_4 or ClO_3 ions, however, periodate is formed. Whether this is due to intermediate formation of hypochlorite, persulphate, or chlorous acid or to some catalytic action is left undecided. T. E.

Sulphur Bromide. GEORG KORNDÖRFER (*Arch. Pharm.*, 1904, **242**, 156—160).—In the preparation of hydrogen bromide by passing hydrogen sulphide into 30 c.c. of bromine covered with water to a depth of 2 cm., the vessel being cooled with water, a few c.c. of a heavy, red, oily liquid were obtained; this contained 69·0 per cent. of bromine; S_2Br_2 requires 71·4.

It is decomposed slowly by cold water, rapidly by hot. Its decomposition by potash was found to take place very nearly according to the equation $2S_2Br_2 + 6KOH = 4KBr + K_2SO_3 + 3S + 3H_2O$; a weighed quantity was mixed with excess of *N*-alkali hydroxide solution, and the excess titrated finally with *N*-acid. The reaction with sodium hydrogen carbonate solution (about *N*/2) was studied by filtering off the sulphur, washing it with sodium hydrogen carbonate solution (it comes through the filter if water is used), oxidising it with fuming nitric acid, and precipitating and weighing as barium sulphate; the filtrate was concentrated and acidified with nitric acid, and silver bromide was precipitated from it and weighed; the filtrate from this was mixed with bromine water and concentrated, and barium sulphate was precipitated from it and weighed. The quantities obtained corresponded within 3—10 per cent. of those required by the equation $2S_2Br_2 + 6NaHCO_3 = 4NaBr + Na_2SO_3 + 3S + 6CO_2 + 3H_2O$. C. F. B.

Preparation of Alkali Hyposulphites. BADISCHE ANILIN- & SODA-FABRIK (D.R.-P. 148125).—Sodium or potassium, or their alloys with lead or mercury, react with sulphur dioxide in presence of ether or well-cooled alcohol, forming alkali hyposulphites, which are very stable in contact with air: $2Na + 2SO_2 = Na_2S_2O_4$. Zinc hyposulphite has been obtained in an unstable form by Nabl (Abstr., 1900, ii, 13) by the action of zinc on an alcoholic solution of sulphur dioxide, and Moissan has found (Abstr., 1903, ii, 75) that alkali hydrides also react with sulphur dioxide, forming hyposulphites. C. H. D.

Absorption of Nitrogen and other Gases, especially those containing Nitrogen, by Metallic Manganese. ALEXANDER P. LIDOFF (*J. Russ. Phys. Chem. Soc.*, 1903, **35**, 1238. Compare Abstr., 1902, 353).—At a high temperature, manganese absorbs nitrogen even more readily than magnesium does, but a mixture of the latter metal with lime absorbs nitrogen far more readily than one of manganese and lime; in the former mixture, a reaction takes place resulting in the formation of metallic calcium, whilst with manganese and lime no such change occurs.

Manganese also absorbs other gases containing nitrogen, such as cyanogen. Its use in gas analysis is therefore recommended.

T. H. P.

Relations between the Nature of the Arc, its Temperature, and the Yield of Nitric Oxide by the Burning of Atmospheric Nitrogen. Franz von Lepel (*Ber.*, 1904, 37, 712—719. Compare Muthmann and Hofer, Abstr., 1903, ii, 206).—By sucking away the gaseous products through porcelain tubes, it was found that the zone of minimum anode activity is quite close to the anode, and conversely, that in the immediate neighbourhood of the cathode the maximum amount of nitric oxide is formed. The arc should be of medium length to obtain the best results, as the yield of nitric oxide is poor with either a short flame and a high temperature or a long flame and a correspondingly low temperature. The time of action should not be too long. The effect of introducing different types of Wehnelt interruptors is dealt with, and the advantages produced by rotating the anode and moistening the cathode with various salts. W. A. D.

Properties of Mixtures of Nitric and Sulphuric Acids. I. A. V. Saposchnikoff (*J. Russ. Phys. Chem. Soc.*, 1903, 35, 1098—1112).—In order to obtain some idea of the causes of the increased nitrating action of a mixture of nitric and sulphuric acids over that of nitric acid alone, the author has studied such mixtures under various physico-chemical aspects: (1) *Vapour pressure.*—The measurement of the vapour pressures was made by passing a known volume of air through the mixtures and determining the amounts of nitric acid passing off with the air. The presence of 2·77 per cent. of sulphuric acid in a mixture of the acids lowers the vapour pressure of nitric acid (at 25°) from 46·20 to 41·24 mm.; this rapid fall the author considers to be due to conversion of the volatile nitric oxide into the non-volatile nitrosylsulphuric acid. For mixtures of the acids containing 95 to 80 per cent. of nitric acid, the vapour pressure remains almost constant, whilst from 70 to 30—25 per cent. the pressure falls from about 39 mm. to about 19·4—16 mm., the curve between these points being very nearly a straight line. At between 25 and 20 per cent. of nitric acid, a point of inflexion occurs in the curve, which afterwards proceeds to the zero of pressure for pure sulphuric acid. Preliminary measurements of the vapour pressure of dilute nitric acid show that the presence of water (14—15 per cent.) in the acid causes a considerable diminution in its vapour pressure, which gradually increases when sulphuric acid is added, until when about 50 per cent. of this acid is present in the mixture the vapour pressure is almost doubled, and indeed about equal to the vapour pressure of pure nitric acid mixed with the same proportion of concentrated sulphuric acid. (2) *Composition of the vapours of mixtures of nitric acid with sulphuric* *acid.*—Determination of the composition of the vapours carried off from mixtures of nitric acid and sulphuric acid shows that the principal action of the sulphuric acid is that of removing excess of water from the nitric acid; any chemical action occurring is limited to the conversion of a portion of the nitric acid into the corresponding anhydride, and this only takes place in presence of a very large proportion of sulphuric acid. (3) *Specific gravity.*—This magnitude gradually increases by the addition to nitric acid of sulphuric acid until about 89 per cent. of the latter is present, when a maximum is reached; after this, it falls to the value for pure sulphuric acid. This maximum value may be contributed to by two causes: firstly, a diminution of the number of molecules of nitric acid present, owing to the dehydration by the sulphuric acid, and secondly, the increase which is known to take place in the sp. gr. of sulphuric acid when small proportions of water are added to it. (4) *Electrical conductivity.*—The variation of the specific conductivity of mixtures of these acids with the proportion of sulphuric acid present is of a very complex character, the curve presenting a minimum, a maximum, and a point of inflexion. The curve for aqueous sulphuric acid is also given, and is likewise of a complex nature. T. H. P.

Action of Carbon Dioxide on Solutions of Sodium Nitrite. CHARLES MARIE and R. MARQUIS (*Compt. rend.*, 1904, 138, 367).—Meunier's conclusion that carbon dioxide does not displace nitrous acid from solutions of its sodium salt (compare this vol., i, 208) is opposed to results previously obtained by the authors (compare Abstr., 1896, i, 403; ii, 364), who have therefore repeated some simple experiments which prove incontrovertibly that carbon dioxide displaces nitrous acid from solutions of sodium nitrite. (1) Pure carbon dioxide was passed into a solution of sodium nitrite containing potassium iodide and starch paste; the development of a blue colour indicated the liberation of iodine by nitrous acid. (2) A solution of potassium iodide and sodium nitrite produced no coloration in chloroform, whilst a similar solution saturated with carbon dioxide caused the chloroform to become violet. (3) A solution of potassium iodide and starch was coloured blue by carbon dioxide which had previously passed through a solution of sodium nitrite. M. A. W.

Action of Carbon Dioxide on Solutions of Sodium Nitrite. LOUIS MEUNIER (*Compt. rend.*, 1904, 138, 502—503. Compare this vol., i, 208).—The author maintains his former conclusion that carbon dioxide does not liberate nitrous acid from aqueous solutions of pure sodium nitrite. The formation of nitrous acid observed in the first two of the experiments quoted by Marie and Marquis as affording evidence to the contrary (preceding abstract) is due to the presence of potassium iodide. With reference to the third experiment, the author suggests that the sodium nitrite used contained small quantities of halogen salts, which behaved similarly to the potassium iodide in the first two experiments. M. A. W.

Molecular Weight of Solid Phosphorus Hydride. RUDOLF SCHENCK and ERNST BUCK (*Ber.*, 1904, 37, 915—917).—The molecular weight of solid phosphorus hydride, $(P_2H)_n$, has been determined by the cryoscopic method in yellow phosphorus solution. The values obtained agree with the formula $C_{12}H_6$. The molecular depression for yellow phosphorus was determined by the aid of naphthalene and found to be 332; the theoretical value obtained by Hell (*Zeit. physikal. Chem.*, 1893, **12**, 196) from Van't Hoff's equation is 384. J. J. S.

Production of Phosphorus Sulphides in the Cold. R. Boulouch (*Compt. rend.*, 1904, **138**, 363—365).—Whilst phosphorus and sulphur combine at high temperatures to form most of the phosphorus sulphides, no compounds are formed by the direct action of the two elements below 100° (compare Abstr., 1902, ii, 560). On the other hand, Dervin obtained the disulphide, P_3S_6, and the sulphide, P_8S_{11}, by prolonged (1—2 months) action of light on mixtures of phosphorus sesquisulphide, P_4S_3, and sulphur in carbon disulphide solution (compare Dervin, Abstr., 1884, 1259), and the author finds that the reaction is much accelerated by the addition of a little iodine to the carbon disulphide solutions, but under these conditions yellow crystals separate from the solution after one or two days which correspond with the formula P_4S_5. The disulphide, P_3S_6, is obtained after one or two days by the action of light on solutions of phosphorus and excess of sulphur in carbon disulphide in the presence of iodine; the addition of phosphorus causes this compound to break down into the lower sulphides of phosphorus. On the other hand, the action of sulphur on excess of phosphorus in carbon disulphide containing iodine is less rapid, and the yellow, crystalline product corresponds with the formula P_3S_5, which may not, however, be a definite compound. M. A. W.

Action of Heat and Light on Mixtures of Phosphorus Sesquisulphide and Sulphur in Carbon Disulphide Solution. E. Dervin (*Compt. rend.*, 1904, **138**, 365—366. Compare preceding abstract).—In view of the results obtained by Boulouch by the action of light on mixtures of phosphorus sesquichloride and sulphur in carbon disulphide solution in the presence of iodine, the author has re-examined the action of light and heat on similar solutions in the absence of iodine, and the result confirms his original conclusions (compare Abstr., 1884, 1259), namely, phosphorus sesquisulphide and sulphur in carbon disulphide solution interact slowly (1 to 2 months) under the influence of sunlight, but rapidly (2 hours) when heated at 210° to form a mixture of Seiler and Ramme's phosphorus disulphide, P_3S_6, crystallising in yellow, transparent needles, and spherical, crystalline masses which correspond with the formula P_8S_{11}, or more probably $P_4S_3,2P_2S_4$. The separation of the two substances is effected by hand sorting, and by heating the crystalline magma to 100° in a sealed tube containing carbon disulphide, when the magma disappears, and crystals of P_3S_6 form in the upper part of the tube, which is kept cool by means of a current of cold water. M. A. W.

Trithio-oxyarsenic Acid. Leroy W. McCay and William Foster, jun. (*Ber.*, 1904, **37**, 573—574).—By the action of magnesia on freshly prepared arsenic pentasulphide, suspended in water, a solution was obtained from which, after removing the magnesium by means of sodium hydroxide, the normal sodium salt of trithio-oxyarsenic acid was isolated. By adding alcohol to the cold solution, the salt slowly separates in feathery crystals, and can be recrystallised from water containing a little sodium hydroxide; in each case, the salt has the composition $Na_3AsOS_3,11H_2O$. T. M. L.

Defects of Uncarburetted Water-gas as Fuel for Laboratory Use. MASUME CHIKASHIGE and HITOSHI MATSUMOTO (*J. Soc. Chem. Ind.*, 1904, **23**, 50—53).—The authors are convinced of the unfitness of this gas for the ordinary purposes of the laboratory. A much larger volume of gas must be supplied to the burner to give a flame of the usual size. Copper air-baths and water-baths are rapidly destroyed by the flame, the bottoms of the baths stripping off as cupric oxide. Nickel crucibles are carbonised, even in one operation, to a brittle black substance. The bottoms of platinum vessels become brittle with a white, crystalline appearance, and after repeatedly heating in the flame may fall to pieces spontaneously. A firmly adherent deposit is formed on the surface of porcelain crucibles, increasing their weight, and rendering accurate quantitative work impossible. Under certain conditions, considerable quantities of carbon monoxide escape unconsumed from the flame. The advantages of the gas are its simplicity of manufacture, the high temperature of the flame, and the smokeless character of the latter, no air-passages being necessary to produce a non-luminous flame.

Experiments were made, following the method of Smithells and Ingle (Trans., 1892, **61**, 204), to ascertain the order in which the constituents burn in the air-fed flame. The results obtained show that the hydrogen burns before the carbon monoxide mixed with it. It follows that the inner cone of the flame of water-gas, and air is that of burning hydrogen, and that in the outer cone of this flame and also in that of hydrocarbon flames the carbon monoxide must be the last constituent to burn. W. P. S.

Change of Rock Crystal into the Amorphous Condition. MORDKO HERSCHKOWITSCH (*Zeit. physikal. Chem.*, 1903, **46**, 408—414).—It is well known that rock crystal loses its property of double refraction when fused. Sometimes in the course of the change an opaque, milky looking product is obtained, which has a sp. gr. between that of rock crystal (2·651) and that of amorphous quartz (2·204), and consists of a mixture of the two. Fused quartz may become opaque at higher temperatures, and this is shown to be due to the reverse change—amorphous ⟶ crystalline; at the ordinary temperature, however, the velocity of this change is practically zero. The elasticity and hardness of amorphous quartz are less than those of rock crystal. The index of refraction of amorphous quartz (n_D 1·45848) is less than that for either ray in the natural quartz. The most refrangible ultra-violet rays pass less readily through amorphous quartz than through rock crystal. J. C. P.

Emanation of Gases Occluded or Disengaged by Radium Bromide. JAMES DEWAR and PIERRE CURIE (*Compt. rend.*, 1904, **138**, 190—192).—0·4 gram of pure dry radium bromide, left for three months in a glass vessel in communication with a Geissler tube exhausted of air, gave off 3 c.c. (at atmospheric pressure) of a gas which was found to be only hydrogen, and due probably to the decomposition of a small quantity of water accidentally introduced with the salt into the tube; the same specimen of radium bromide was heated to fusion in a quartz flask and the occluded gases withdrawn by means of a mercury pump, the larger part of the emanation and the less volatile gases were retained in three small U-tubes placed in liquid air; the rest of the gas collected over mercury measured 2·6 c.c. at atmospheric pressure, it was radioactive and luminous, and after an exposure of three days with a quartz photographic spectroscope gave a discontinuous spectrum consisting of three lines coincident with the three principal bands of nitrogen, 3800, 3580, and 3370 (compare Huggins, this vol., ii, 4). During the three days, the glass of the tube acquired an intense violet colour, and half the gas was absorbed. The spark spectrum of the gas also showed only the bands characteristic of nitrogen, even after condensing the nitrogen by means of liquid hydrogen.

The quartz tube containing the fused radium bromide deprived of all occluded gases was sealed and examined spectroscopically 20 days later by Deslandres, with the result that the gas in the tube gave the entire spectrum of helium, there being no lines of any other gas even after an exposure of 3 hours (compare Ramsay and Soddy, Abstr., 1903, ii, 622). M. A. W.

Radioactive Gas in the Soil and Water near New Haven. H. A. BUMSTEAD and L. P. WHEELER (*Amer. J. Sci.*, 1904, [iv], **17**, 97—111. Compare this vol., ii, 29).—The radioactive gas found in the ground and in the surface water near New Haven seems to be identical with the radium emanation. If any other radioactive constituent is present, it can be in very small amount only. The density of the radium emanation, as determined by its rate of diffusion, is about four times that of carbon dioxide. The authors were unable to obtain the radioactive gas from mercury, recently described by Strutt (*Phil. Mag.*, July, 1903) and are inclined to attribute his results to an impurity in the mercury used. A. McK.

Preparation of Alkali Oxides. BADISCHE ANILIN- & SODA-FABRIK (D.R.-P. 147933. Compare Abstr., 1903, ii, 646).—Metallic sodium or potassium is intimately mixed with the peroxide of the same metal, and the powder thus obtained is ignited by means of a heated wire, and is then heated to bright redness. The reaction occurs rapidly, but not explosively, and the walls of the vessel are therefore little attacked. Air must be excluded, especially in the case of potassium, which readily regenerates the peroxide. C. H. D.

Determination of the Electrochemical Equivalent of Silver. G. VAN DIJK and J. KUNST (*Proc. K. Akad. Wetensch. Amsterdam*, 1903, **6**, 441—449).—The authors have re-determined the electrochemical equivalent of silver. A tangent galvanometer was used for the measurement of the strength of the current, the horizontal intensity of the terrestrial magnetism having been measured before and after the passage of the current. The cathodes consisted of platinum, two of them being cup-shaped, whilst the third was a cylinder ending in a hemisphere; the anode was a silver rod.

The electrolyte was a 20 per cent. neutral solution of silver nitrate. As a mean of 24 determinations, the value obtained was 0·0111818 ± 0·0000004 (mean error). A. McK.

Solidification and Transformations of Mixtures of Silver Nitrate and Potassium Nitrate. A. Ussow (*Zeit. anorg. Chem.*, 1904, **38**, 419—428).—The temperatures at which mixtures of varying amounts of silver nitrate and potassium nitrate solidified were determined experimentally and the results depicted graphically. At 134·3°, the double salt, $AgNO_3,KNO_3$, is in equilibrium with potassium nitrate and the solution, and this equilibrium is always attained in all mixtures containing between 46 and 100 per cent. of potassium nitrate. A. McK.

Solubility of some Sparingly Soluble Silver Salts. Richard Abegg [with A. J. Cox] (*Zeit. physikal. Chem.*, 1903, **46**, 1—12).—Using the ordinary compensation method, the authors have determined the potential differences at electrodes of the type Ag | AgX, *N*/10MX, where AgX is a sparingly soluble silver salt, and MX is a soluble salt of the metal M with the same anion. According to Nernst's theory, it is then possible to calculate the solubility of AgX. With the following soluble electrolytes and the corresponding silver salts as depolarisers, the silver potentials found were (in volts): KBr $-$ 0·133; KCNS $-$ 0·127; KCl $+$ 0·015; $\frac{1}{2}Ba(OH)_2 + 0{\cdot}111$; $\frac{1}{2}Na_2CO_3 + 0{\cdot}226$; $\frac{1}{2}K_2CrO_4 + 0{\cdot}227$; $\frac{1}{2}Na_2B_4O_7 + 0{\cdot}343$. The order of the potential differences gives the order of solubility of the silver salts only where these are of the same dissociating type. The authors have tabulated all the values found by different investigators for the solubility of sparingly soluble silver compounds. J. C. P.

Action of Carbon on Quicklime at the Temperature of Fusion of Platinum. Henri Moissan (*Compt. rend.*, 1904, **138**, 243—245).—A mixture of quicklime and sugar carbon in the proportion required to form calcium carbide, CaC_2, was heated to the temperature at which platinum fuses by placing it in a graphite boat in a quartz tube in an oxyhydrogen blowpipe furnace (compare Abstr., 1902, ii, 122); at this temperature, no calcium carbide was formed, but the quartz tube softened and small crystals of calcium silicate were detected on the surface of the lime, showing that at the temperature of 1200° silica has an appreciable vapour tension, a characteristic which seriously limits its application to high temperature reactions. Some crystals of calcium carbide heated in a quartz tube in the same furnace showed no signs of liquefaction; the fusion point of calcium carbide is therefore higher than that of platinum. The author has previously shown that platinum melts at the temperature at which fused calcium carbide solidifies (compare Abstr., 1894, i, 313), and similar results were obtained when a platinum iridium alloy replaced the platinum. M. A. W.

Hardening of Barium Sulphate. Paul Rohland (*Zeit. anorg. Chem.*, 1904, **38**, 311—318. Compare Abstr., 1903, ii, 539).—Barium sulphate does not undergo reactions involving hydration or hardening owing to its sparing solubility in water. The solubility of barium sulphate in water is, however, increased by the addition of aluminium chloride, ferric chloride, magnesium chloride, or ammonium nitrate. The hardening of barium sulphate may be effected by the same method as is used in the case of kaolin. Finely-divided heavy spar is intimately mixed with a 10 per cent. solution of one of the chlorides enumerated, when a plastic mass, containing 12—13 per cent of water and 1·1—1·4 per cent. of the chloride used is obtained. The total loss on heating at 580° was 11·6 per cent.

The theory of the hardening of barium sulphate is discussed.

A. McK.

Glucinum Compounds. I. Fritz Haber and G. Van Oordt (*Zeit. anorg. Chem.*, 1904, **38**, 377—398).—Glucinum hydroxide, when freshly precipitated, is gelatinous, readily absorbs carbon dioxide, and is easily soluble in potassium carbonate, ammonium carbonate, dilute sodium hydroxide, or dilute acids. It loses these properties when it is heated with water, dilute ammonia, or alkali carbonates, or even when it is allowed to remain at the ordinary temperature. The transformation is particularly rapid when hot alkalis are used; the influence of the concentration of the alkali in promoting the change has been studied. The contradictions found in the literature respecting glucinum hydroxide are to be ascribed to the different conditions employed by the various investigators for its preparation.

A. McK.

Specific Gravity of Zinc Chloride. Gregory P. Baxter and Arthur Becket Lamb (*Amer. Chem. J.*, 1904, **31**, 229—235).—The sp. gr. of pure dry zinc chloride, prepared by igniting the double ammonium salt, $ZnCl_2,3NH_4Cl$, in a current of dry hydrogen chloride, was determined by means of the pyknometer described in the following abstract, pure toluene being employed as the liquid. The average of five determinations gave the sp. gr. 2·907 at 25°/4°.

E. G.

Specific Gravities of Cadmium Chloride and Cadmium Bromide. Gregory P. Baxter and Murray Arnold Hines (*Amer. Chem. J.*, 1904, **31**, 220—228).—The determinations described in this paper were carried out with a special form of pycnometer, consisting of a weighing bottle provided with two glass stoppers; one of these stoppers was of the ordinary form and was used during the weighing of the salt, whilst the other was furnished with two capillary tubes by means of which the vessel was filled with liquid. A diagram of this apparatus is given.

The liquid employed was carefully purified toluene of sp. gr. 0·86138 at 25°/4°. In order to check the accuracy of the method, the sp. gr. of silver bromide was first determined and found to be 6·478 at 25°/4°.

The sp. gr. of pure dry cadmium chloride, prepared by igniting the double ammonium salt, $CdCl_2,NH_4Cl$, in a current of dry hydrogen chloride, was found to be 4·049, and that of cadmium bromide 5·196 at 25°/4°. E. G.

A Cadmium Arsenide. ALBERT GRANGER (*Compt. rend.*, 1904, 138, 574—575).—An arsenide of cadmium of the composition Cd_3As_2 is formed by heating metallic cadmium to bright redness in a current of arsenic vapour diluted with hydrogen. The new arsenide is obtained as a sublimate of shining, red octahedra having the sp. gr. 6·211 at 15°. It is attacked by cold dilute nitric acid, aqua regia, chlorine or bromine. S. S.

Basic Lead Salts. DANIEL STRÖMHOLM (*Zeit. anorg. Chem.*, 1904, **38**, 429—455. Compare Abstr., 1903, i, 138).—Most of the basic salts described were prepared as follows. A calculated amount of the alkali salt in about *N*/10 solution was added to lead hydroxide and the solution was titrated with *N*/50 sulphuric acid as soon as the equilibrium had been established. With further addition of the alkali salt, the alkalinity of the solution remained approximately constant, until, finally, a point was reached when the alkalinity diminished. The salt so prepared was washed by decantation and dried, care being taken to avoid any interaction with carbon dioxide. The majority of the salts described are distinctly crystalline.

The *salt*, $6PbO,PbCl_2,2H_2O$, crystallises in needles and, when heated, changes in colour from grey to yellow. The *salt*, $3PbO,PbCl_2,\frac{1}{2}H_2O$, crystallises in yellow needles. The following *salts* were prepared: $6PbO,PbBr_2,2H_2O$ (white needles); $PbO,PbBr_2,H_2O$ (needles); $6PbO,PbI_2,2H_2O$ (needles); $9PbO_2,PbI_2,2H_2O$; $3PbO,PbI_2,H_2O$; PbO,PbI_2,H_2O; $6PbO,Pb(CNS)_2,2H_2O$(?); $PbO,Pb(SCN)_2,H_2O$; $3PbO,Pb(BrO_3)_2,2H_2O$; $3PbO,Pb(1O_3)_2,2H_2O$; $3PbO,PbSO_4,H_2O$; $PbO,PbSO_4$; $3PbO,PbSeO_4,H_2O$; $3PbO,PbCrO_4,H_2O$; $PbO,PbCrO_4$; $15PbO,2As_2O_5$(?); $3PbO,4PbCO_3,2H_2O$; $7PbO,3PbC_2O_4,H_2O$(?); $3PbOPb[C_6H_2(NO_2)_3O]_2,2\frac{1}{2}H_2O$. The constitution of these salts is also discussed. A. McK.

Action of Ammonia on Copper Sulphate Solutions. JAMES LOCKE and JACOB FORSSALL (*Amer. Chem. J.*, 1904, **31**, 268—298).—Recent investigations have shown that when ammonia is added to a solution of copper sulphate a complex radicle is formed which contains not more than 4 mols. of ammonia to 1 atom of copper. Dawson and McCrae (Trans., 1900, **77**, 1252) obtained results in which the ratio of copper to combined ammonia ($Cu:NH_3$) varied from 1:3·14 to 1:3·96. This variation was probably due to the fact that the methods employed did not give the correct values for the concentration of the residual ammonia.

In the experiments now described, the lowering of the vapour pressure of a solution of ammonia produced by the addition of copper sulphate was determined by a modification of Gaus' method (Abstr., 1900, ii, 7), in which a known volume of electrolytic gas is passed through the solution and thence into standard hydrochloric acid. The diminution in the conductivity of the acid as it becomes partially neutralised indicates the amount of ammonia taken up by the gas, and from these data its partial pressure in the solution is calculated. The method is fully described, and a diagram of the apparatus is given. The error introduced due to the solubility of ammonia in copper sulphate solution being less than its solubility in water was estimated and the necessary correction applied.

The results show that in dilute solutions only one complex, $Cu(NH_3)_4$, is formed and that practically the whole of the copper in the solution passes into this form. With higher concentrations of the ammonia, a small quantity of a complex, $Cu(NH_3)_5$, is produced, and in ammonia solutions of approximately normal strength this amounts to about 3 per cent. of the total copper present. E. G.

Evolution of Oxygen from Cupric Metaborate. W. Guertler (*Zeit. anorg. Chem.*, 1904, 38, 456—460).—When an aqueous solution of copper nitrate (1 mol.) and boric acid (2 mols.) is evaporated and the product melted at a temperature not exceeding 950°, *cupric metaborate* is formed. It crystallises in blue needles, has a degree of hardness of the same order as that of corundum, is insoluble in cold dilute mineral acids and in hydrofluoric acid, but is soluble in hot concentrated hydrochloric acid. When melted, it forms a hard glass, which is soluble in cold dilute acids. Cupric metaborate is more easily prepared by fusing copper nitrate with an excess of boric acid, when two layers are formed, the lower one consisting almost entirely of cupric metaborate. Oxygen is rapidly evolved when cupric metaborate is heated at about 1000°; oxygen begins to come off at about 875°; the salt melts at about 970°. Analysis showed that the action probably proceeds according to the equation :

$$12CuB_2O_4 = 2(3Cu_2O,2B_2O_3) + 3O_2 + 8B_2O_3.$$

A. McK.

Acid Sulphates of the Rare Earths. Bohuslav Brauner and Jan Picek (*Zeit. anorg. Chem.*, 1904, 38, 322—341).—An historical survey of the acid sulphates of the rare earths is first given.

In attempting to prepare cerium hydrogen sulphate by Wyrouboff's directions, the authors found it impossible to separate the crystals of the acid salt from adhering sulphuric acid at the ordinary pressure without causing decomposition of the salt. The separation could, however, be effected by heating under diminished pressure at a temperature not sufficiently high to cause decomposition of the sulphate.

Cerium hydrogen sulphate, $Ce(SO_4H)_3$, was prepared by dissolving normal cerium sulphate in ice-cold water and then adding an excess of sulphuric acid. The acid salt which separates may occasionally be contaminated with the hydrate of the normal salt, which is, however, readily converted into the acid salt by heating. The acid salt was freed from sulphuric acid in a Sprengel vacuum at 130°; it forms colourless, glistening needles.

Lanthanum hydrogen sulphate, $La(SO_4H)_3$, forms colourless, silky needles. *Praseodymium hydrogen sulphate*, $Pr(SO_4H)_3$, forms green, silky needles. *Neodymium hydrogen sulphate*, $Nd(SO_4H)_3$, forms rose-coloured, silky needles. *Samarium hydrogen sulphate*, $Sm(SO_4H)_3$, forms golden, silky needles. *Yttrium hydrogen sulphate*, $Y_2(SO_4H)_3$, forms colourless pyramids. *Thorium hydrogen sulphate*, $ThH_2(SO_4)_3$, is formed with difficulty owing to the sparing solubility of normal thorium sulphate in concentrated sulphuric acid. The salt is different from the compound $2Th(SO_4)_2,H_2SO_4,2H_2O$, which Manuelli and Gasparinetti claim to have prepared (Abstr., 1903, ii, 375).

The decomposition of these acid salts in a Sprengel vacuum has also been studied. Decomposition does not begin in any case below 180°; above this temperature, sulphuric acid is formed. No pyrosulphate was formed.
A. McK.

Chemistry of the Rare Earths. Lanthanum Alums. New Double Sulphates. CHARLES BASKERVILLE and EUGENE G. MOSS (*J. Amer. Chem. Soc.*, 1904, 26, 67—71).—A number of experiments have been carried out with the object of preparing lanthanum alums. Owing, however, to the formation of a comparatively insoluble hydrate of lanthanum sulphate, $La_2(SO_4)_3,9H_2O$, and to the separation of sparingly soluble double sulphates, the alums could not be obtained. The following double *salts* were prepared and analysed: $La_2(SO_4)_3,Rb_2SO_4,2H_2O$; $La_2(SO_4)_3,Cs_2SO_4,2H_2O$; $La_2(SO_4)_3,Rb_2SO_4$; $3La_2(SO_4)_3,2Rb_2SO_4$; and $3La_2(SO_4)_3,2Cs_2SO_4$.
E. G.

Chemistry of the Rare Earths. Lanthanates. CHARLES BASKERVILLE and GEORGE F. CATLETT (*J. Amer. Chem. Soc.*, 1904, 26, 75—80).—Lanthanates and metalanthanates may be obtained by fusing lanthanum oxide with an alkali carbonate or by heating the oxide with a concentrated solution of an alkali hydroxide at 100°. *Sodium tetralanthanate*, $Na_2La_4O_7$, *sodium metalanthanate*,

$$NaH_9La_5O_{15},4H_2O,$$

lithium metalanthanate, $LiH_9La_5O_{15},2H_2O$, *barium metalanthanate*, $Ba(H_9La_5O_{15})_2$, and *potassium metalanthanate* were prepared and analysed. These compounds are of no value for the separation and purification of lanthanum.
E. G.

Chemistry of the Rare Earths. Neodymium; Preparation of Pure Material, and Efforts to Decompose it into its Constituents. CHARLES BASKERVILLE and RESTON STEVENSON (*J. Amer. Chem. Soc.*, 1904, 26, 54—64).—Neodymium may be freed from lanthanum by saturating a solution of neodymium chloride with hydrogen chloride until no more crystals separate. The crystals are redissolved and reprecipitated in the same way; after seven such precipitations, the final product is absolutely free from lanthanum.

The pure neodymium compound thus obtained was used in unsuccessful attempts to prove its complexity. The methods employed were as follows. Fractional precipitation with hydrogen chloride; partial decomposition by fusing the double alkali nitrates; precipitation with ammonium oxalate; solution of the hydroxide in ammonium carbonate and precipitation with acetic acid; fractional precipitation with aniline, benzylamine, piperidine, or phenylhydrazine. E. G.

Chemistry of the Rare Earths. Praseodymium and its Citrate. CHARLES BASKERVILLE and J. W. TURRENTINE (*J. Amer. Chem. Soc.*, 1904, **26**, 46—53).—The following method is recommended for the rapid preparation of pure praseodymium compounds. Praseodymium ammonium nitrate containing about 10 per cent. of lanthanum is converted into the hydroxide, which is washed free from ammonium salts and afterwards added to a concentrated aqueous solution of citric acid until the solution is saturated. On heating this solution, a pale green, amorphous precipitate is produced, which is collected, washed with hot water, and afterwards dried. *Praseodymium citrate* is thus obtained as a loose, amorphous powder of a pale green colour.

Attempts were also made to prepare pure praseodymium compounds by means of potassium iodate, hydrofluoric acid, hydrochloric acid, formaldehyde, potassium pyrosulphate, alkali hydroxides, sodium peroxide, or by the formation of alums, but in all cases the results were unsatisfactory. E. G.

Chemistry of the Rare Earths. Attempts to prepare Praseodymium and Neodymium Alums. New Double Sulphates. CHARLES BASKERVILLE and HAZEL HOLLAND (*J. Amer. Chem. Soc.*, 1904, **26**, 71—75).—Attempts to prepare praseodymium and neodymium alums by mixing solutions of their sulphates with varying proportions of alkali sulphates were unsuccessful. The following double *salts* were obtained: $Pr_2(SO_4)_3,Cs_2SO_4,2H_2O$; $Pr_2(SO_4)_3,Cs_2SO_4,4H_2O$; and $Nd_2(SO_4)_3,Cs_2SO_4,3H_2O$. E. G.

Aluminium Powder and the Oxidation of Aluminium. ÉMILE KOHN-ABREST (*Bull. Soc. chim.*, 1904, [iii], **31**, 232—239).—The percentage composition of a commercial specimen of aluminium powder, previously freed from fat by extraction with ether, was found to be: aluminium and iron, 91·2; alumina, 5·8; silica, 1·3; graphitoidal silicon and other insoluble matter, 0·4; carbon, 0·23; moisture and loss, 1·07.

The aluminium was estimated either by (1) collecting and weighing the water produced by passing the hydrogen evolved by the solution of a known weight of the aluminium powder in dilute hydrochloric acid over heated cupric oxide, or (2) by a modification of Wahl's method of estimating metallic zinc in zinc dust (Abstr., 1898, ii, 190).

It was found possible to estimate directly the alumina and silica in the powder by heating the latter in air at a temperature above 175° for 12 hours, the alumina being thereby rendered insoluble in hydrochloric acid. The alumina produced by this treatment was corrected for by observing the increase in weight which resulted from the heating and assuming that this was due to the conversion of aluminium into alumina.

When aluminium powder is added to freshly precipitated aluminium hydroxide, suspended in water containing ammonia, it appears to be absorbed by the hydroxide with the formation of a suboxide. This change also occurs partially and slowly in presence of ammonium chloride. It is suggested that the suboxide is analogous in constitution to the lower chloride and sulphate of aluminium described by Berzelius and others. T. A. H.

Mangani-manganates of the Alkaline Earths. Victor Auger and M. Billy (*Compt. rend.*, 1904, 138, 500—502).—The substances hitherto described as manganates of the alkaline earths are not pure compounds. Dulaurier's calcium manganate, for example (*Chem. News*, 1869, 20, 240), is only a mixture of calcium carbonate, manganese dioxide, and calcium manganate. Pure compounds of the type $M_3Mn_2O_8,H_2O$ can be obtained by fusing at a suitable temperature (180° to 250°) mixtures of the hydroxide of the alkaline earth, sodium and potassium nitrates, and potassium permanganate; the salts probably have the constitution represented by the formula

$$OH\cdot M\cdot O\cdot MnO\cdot O\cdot M\cdot O\cdot MnO_2\cdot O\cdot M\cdot OH,$$

and are therefore to be regarded as *mangani-manganates.*

Barium mangani-manganate, $Ba_3Mn_2O_8,H_2O$, identical with Cassel's green or Rosenstiehl's "basic barium manganate" (*J. Pharm. Chim.*, 1864, [iii], 46, 344), is most conveniently prepared by the general method given above; it is a green powder, insoluble in water, and can be heated to redness without losing its water of hydration. M. A. W.

Sodium Ferric Sulphates. Anton Skrabal (*Zeit. anorg. Chem.*, 1904, 38, 319—321).—When a solution of ferric sulphate, containing a little sulphuric acid, is gradually heated on a boiling water-bath with an excess of Glauber's salt, *basic sodium ferric sulphate* of the composition $2Na_2O,Fe_2O_3,4SO_3,7H_2O$ separates; it forms yellow, silky crystals and is soluble in water with difficulty; it is decomposed by water. *Sodium ferric sulphate*, $3Na_2O,Fe_2O_3,6SO_3,6H_2O$, prepared by first heating Glauber's salt until it melts in its water of crystallisation and then adding ferric sulphate and concentrated sulphuric acid, is colourless and is slowly dissolved by water with decomposition. A. McK.

Allotropic Transformations of Nickel Steels. Octave Boudouard (*Compt. rend.*, 1904, 138, 370—371).—By means of a thermoelectric method previously described (compare this vol., ii, 127), the author has determined the temperatures at which certain nickel steels undergo molecular transformation. The steels employed were those already examined by Guillet with regard to their micrographical and mechanical properties (compare Guillet, Abstr., 1903, ii, 267, 650). The temperatures of molecular transformation were indicated by irregularities on the curve obtained by plotting as abscissæ the temperature of the bar of steel under investigation against the difference of potential of thermoelectrical origin between the two extremities of the bar as ordinates. The results obtained with two series of steels containing 0·2 and 0·8 per cent. of carbon respectively, with a proportion of nickel varying from 2 to 30 per cent. in each series, are given; only those steels with a low nickel content give curves which exhibit irregularities. M. A. W.

Solvent Power and Electrical Conductivity of Liquid Nickel Carbonyl. Alwin Mittasch (*Zeit. physikal. Chem.*, 1903, **46**, 37—42).—Numbers of inorganic and partly organic electrolytes have been found to be practically insoluble in nickel carbonyl, and the conductivity of the latter (1×10^{-9}) is accordingly affected only to a very slight extent by shaking with these electrolytes. Some organic non-electrolytes, such as camphor and alcohol, are more readily soluble. It is noteworthy that Apt finds the dielectric constant of liquid nickel carbonyl to be as low as 2·2. J. C. P.

Chlorinated Molybdates and the Acids from which they are derived. Rudolf F. Weinland and W. Knöll (*Ber.*, 1904, **37**, 569—573).—*Cæsium chloromolybdate*, MoO_2Cl_3Cs,H_2O, prepared by the action of cæsium chloride on a solution of molybdic acid in hydrochloric acid, forms small, prismatic, pale greenish-yellow crystals, and on heating liberates water, hydrogen chloride, and finally some colourless molybdenum oxychloride. The *rubidium* salt,

$$MoO_2Cl_3Rb,H_2O,$$

forms small, flat, well-formed prisms. A *potassium* salt also appears to exist. *Pyridine chloromolybdate*, $MoOCl_3{\cdot}OH,C_5H_5N,2H_2O$, forms colourless flakes. *Quinoline chloromolybdate*,

$$MoOCl_3{\cdot}OH,C_9H_7N,2H_2O,$$

forms colourless flakes, but separates from concentrated hydrochloric acid in needles. *Chloromolybdic acid*, $MoOCl_3{\cdot}OH,7(?)H_2O$, prepared by cooling a solution of molybdic acid saturated with hydrogen chloride, was also found to separate in attempting to prepare the calcium, magnesium, and ammonium salts; it forms flat prisms, decomposes in the air in the course of a few minutes, and slowly effloresces over sulphuric acid. T. M. L.

Yellow Phosphomolybdic Acid. Arturo Miolati (*Gazzetta*, 1903, **33**, ii, 335—348).—The author has repeated many of the measurements made by Levi and Spelta (Abstr., 1903, ii, 731), but with different results. Purified phosphomolybdic acid,

$$H_3PO_4,12MoO_3,29H_2O,$$

on titration with sodium hydroxide, using phenolphthalein or litmus as indicator, is found to contain 26, not 27 displaceable hydrogen atoms; this fact is explained by assuming that 24 of the mols. of alkali required for neutralisation are utilised by the $12MoO_3$, and that phosphoric acid behaves in a normal manner as a dibasic acid. Levi and Spelta's assumption would require phosphoric acid to be a tribasic acid in presence of the indicators named. The variation in the electrical conductivity of phosphomolybdic acid in aqueous solution with increasing dilution does not correspond with that of a tribasic acid, even assuming that the complex compound is hydrolysed into phosphoric and molybdic acids; it appears rather that the phosphomolybdic acid splits off molybdic acid in solution, retaining phosphoric acid in the form of another complex with fewer MoO_3 groups.

From a study of the electrical conductivity of the acid during neutralisation, it appears that the acid is hexabasic; the conductivity continually diminishes until 6 mols. of sodium hydroxide have been added, subsequent to which there is a continuous and steady increase until 26 mols. are present, when each additional mol. of alkali causes an abnormally large increase. It is probable that by any excess of alkali over the six mols. required for neutralisation the hexabasic acid is resolved progressively into phosphoric and molybdic acids. The change of conductivity of a solution having the composition $H_3PO_4,12MoO_3,6NaOH$, with increasing dilution agrees well with that of a normal salt of a hexabasic acid normally dissociated.

W. A. D.

Solubility and Decomposition of Double Salts in Water. III. EBERHARD RIMBACH [with H. BÜRGER and A. GREWE] (*Ber.*, 1904, **37**, 461—487. Compare Abstr., 1898, ii, 158; 1902, ii, 306).—The decomposition of various uranyl double salts by water at different temperatures has been determined quantitatively. The uranyl double salts examined are analogous to the cadmium double chlorides previously described (*loc. cit.*).

Solubility determinations were conducted with the pure double salts, and the composition of the solutions, obtained at varying temperatures, was determined analytically.

Uranyl potassium chloride, $UO_2Cl_2,2KCl,2H_2O$, undergoes decomposition at temperatures below 60° in such a manner that the saturated solution contains an excess of uranyl chloride, whilst the solid in contact with the solution consists of uranyl potassium chloride and potassium chloride. Above 60°, the composition of the saturated solution is identical with that of the solid, and from the saturated solution the double salt may be obtained pure when the proper temperature conditions are observed. When a concentrated aqueous solution, containing uranyl and potassium chlorides in the molecular proportions 1 : 2 respectively, and containing also at least 15 per cent. of hydrochloric acid, is allowed to crystallise, the decomposition of the double salt, which, as noted above, occurs at temperatures below 60°, does not take place.

Uranyl ammonium chloride suffers decomposition in an analogous manner to uranyl potassium chloride.

Uranyl rubidium chloride, $UO_2Cl_2,2RbCl,2H_2O$, is isomorphous with the potassium and ammonium salts, but differs from them in its behaviour towards water, since it remains undecomposed, both at high and low temperatures. Uranyl cæsium chloride, $UO_2Cl_2,2CsCl$, behaves similarly.

Uranyl tetramethylammonium chloride, $UO_2Cl_2,2NMe_4Cl$, and *uranyl-tetraethylammonium chloride*, $UO_2Cl_2,2NEt_4Cl$, are not decomposed by water. *Uranyl potassium nitrate*, $UO_2(NO_3)_2,KNO_3$, prepared from potassium diuranate and a large excess of nitric acid, is very hygroscopic. At temperatures below 60°, the solid phases, uranyl potassium nitrate and potassium nitrate, are formed, whilst the supernatant saturated solution is enriched by uranyl nitrate. At about 60°, the end of the transition interval is reached. The behaviour of *uranyl ammonium nitrate*, $UO_2(NO_3)_2,NH_4NO_3$, is similar. *Uranyl rubidium nitrate*, $UO_2(NO_3)_2,RbNO_3$, prepared from uranyl nitrate (1 mol.) and rubidium nitrate (1 mol.) dissolved in excess of nitric acid, is soluble without decomposition at 80°. *Uranyl cæsium nitrate*, $UO_2(NO_3)_2,CsNO_3$, like the analogous salts, is decomposed at low temperatures.

Uranyl potassium sulphate, $(UO_2)SO_4,K_2SO_4,2H_2O$, prepared by dissolving potassium diuranate in sulphuric acid or by allowing an aqueous solution containing molecular properties of the two components to crystallise under diminished pressure, is stable towards water, as are also *uranyl ammonium sulphate*,

$$(UO_2)SO_4,(NH_4)_2SO_4,2H_2O,$$

and *uranyl rubidium sulphate*, $(UO_2)SO_4,Rb_2SO_4,2H_2O$. *Uranyl dipotassium sulphate*, $(UO_2)SO_4,2K_2SO_4,2H_2O$, prepared by dissolving uranyl sulphate in an excess of potassium sulphate solution and then crystallising from the hot solution, is decomposed by water at lower temperatures, the solid phases consisting of the di- and mono-salts, whilst the solution is enriched in potassium sulphate. At 80°, the transition interval is not quite attained.

Uranyl hydroxylamine sulphate, $2(UO_2)SO_4,(NH_2{\cdot}OH)_2,H_2SO_4,5H_2O$, prepared from a solution of uranyl sulphate and hydroxylamine sulphate in molecular proportions, separates in yellowish-green aggregates. It appears to be stable towards water at the ordinary temperature.

Uranyl sodium chromate, $2(UO_2)CrO_4,Na_2CrO_4,10H_2O$, is undecomposed by water at 20°. Uranyl potassium arsenate, $(UO_2)KAsO_4,3\frac{1}{2}H_2O$, is a yellow powder, which is stable towards water.

Uranyl potassium propionate, $UO_2(C_3H_5O_2)_2KC_3H_5O_2$, is decomposed by water at 29·4°, potassium propionate going into solution and the solid phases consisting of uranyl propionate and uranyl potassium propionate. *Uranyl ammonium propionate*,

$$2UO_2(C_3H_5O_2)_2,NH_4(C_3H_5O_2),2H_2O,$$

is stable towards water at 29·8°. *Uranyl potassium butyrate*,

$$UO_2(C_4H_7O_2)_2,KC_4H_7O_2,$$

and *uranyl potassium valerate*, $UO_2(C_5H_9O_2)_2,KC_5H_9O_2,2H_2O$, suffer decomposition at the ordinary temperature.

The compounds examined, more particularly the double nitrates, were fluorescent. The potassium and rubidium double sulphates and the potassium, ammonium, and rubidium double nitrates exhibited radioactivity.

Crystallographic measurements of several of the compounds described are quoted. A. McK.

Preparation and Properties of Some New Fluorine Compounds. Otto Ruff, Wilhelm Plato, and, in part, Hugo Graf (*Ber.*, 1904, **37**, 673—683. Compare Abstr., 1903, ii, 550).—The fluorides described have been prepared by the action of anhydrous hydrogen fluoride on the corresponding chlorides; owing to the relatively high volatility of the hydrogen chloride formed and the presence of an excess of hydrogen fluoride, the reversible change expressed by the equation $x(HF)_2 + MCl_n \leftrightarrows MF_n + 2xHCl$ takes place in one direction only. The hydrogen fluoride was prepared and the experiments carried out in special platinum apparatus, for the details of which the original should be consulted.

Titanium tetrafluoride (*loc. cit.*) boils at 284° (corr.), has a sp. gr. 2·798 at 20·5°/4°, and a vapour density of 129.

Antimony pentafluoride, SbF_5, is a colourless, viscid liquid, which solidifies when cooled; it is very hygroscopic, forming a hydrate, $SbF_5,2H_2O$, boils at 155°, and has a sp. gr. 2·993 at 22·7°/4°.

Antimony pentafluoride diantimony trifluoride, Sb_3F_{11}, prepared by distilling a mixture of the penta- and tri-fluorides, is a hygroscopic, colourless, transparent, crystalline substance, which boils at 390°, and has a sp. gr. 4·188 at 21°/4°. When the trifluoride is present in excess, *antimony pentafluoride-penta-antimony trifluoride*, boiling at about 384° (corr.), is formed.

Tin tetrafluoride is a hygroscopic, crystalline substance; it boils at 705°, subliming below this temperature, and has a sp. gr. 4·78 at 19°/4°.

It is worthy of note that the molecular volume of these fluorine compounds is very much less than that of the corresponding chlorides.

E. F. A.

Constitution and Properties of Vanadium Steels. Léon Guillet (*Compt. rend.*, 1904, **138**, 367—369).—According to their micrographical properties, vanadium steels may be divided into three groups: (1) those containing 0·200 per cent. of carbon and less than 0·7 per cent. of vanadium, which present the same structure as the carbon steels; (2) those containing 0·200 or 0·800 per cent. of carbon and 0·7 to 3 per cent. of vanadium, which exhibit perlite or carbide structure; (3) those containing more than 3 per cent. of vanadium, in which all the carbon is combined as vanadium carbide or a double carbide of vanadium and iron. The steels belonging to the first two groups have a breaking weight and elastic limit higher than those of ordinary steels with the same percentage of carbon, but they are harder and more fragile, whilst the steels of the third group have a very low breaking weight and elastic limit and are very fragile.

M. A. W.

Electrolytic Preparation of Salts of Tervalent Vanadium. A. Bültemann (*Zeit. Elektrochem.*, 1904, **10**, 141—143).—A convenient method of carrying out the electrolytic reduction of vanadium salts described by Piccini (Abstr., 1896, ii, 304) and Piccini and Brizzi (Abstr., 1899, ii, 297) is given. A clean lead or platinum cathode and porous diaphragm are used; the current efficiency is practically quantitative with cathodic current densities up to 0·05 ampère per sq. cm. Ammonium vanadium alum, $V_2(SO_4)_3,(NH_4)_2SO_4,24H_2O$, crystallises in blue crystals from a solution containing sulphuric acid, but red crystals are obtained from neutral solutions. The rubidium and cæsium alums behave in the same way.

T. E.

Action of the Halogen Acids on Vanadic Acid. FRANK A. GOOCH and R. W. CURTIS (*Amer. J. Sci.*, 1904, [iv], **17**, 41—48).—The reducing action of hydrochloric, hydrobromic, and hydriodic acids respectively on vanadic acid has been studied. The extent of reduction is shown to depend on the concentrations of the respective acids. Hydrochloric acid, even in the cold, reduces vanadic acid to the stage corresponding with the tetroxide, and the reduction does not proceed further. The reduction may proceed further when hydrobromic acid is used, whilst with hydriodic acid it may be carried at will to either of the stages, that of the trioxide or that of the tetroxide. A. McK.

Stibine and Yellow Antimony. ALFRED STOCK and OSKAR GUTTMANN (*Ber.*, 1904, **37**, 885—900. Compare Abstr., 1901, ii, 556; 1902, ii, 507).—In the preparation of antimony hydride it is essential to add the antimony-magnesium alloy to the dilute hydrochloric acid and not *vice versâ*. An apparatus is described by means of which the finely-divided alloy may be automatically dropped into the acid. The density of the gas is 4·360 at 15° and 754 mm. (air = 1) and is some 2·95 per cent. higher than the normal value, probably owing to the molecular attractions of the heavy molecules. The liquid hydride has a sp. gr. 2·26 at − 25° and 2·34 at − 50°. At the ordinary temperature, 1 vol. of water dissolves 0·2 vols of gas; 1 vol. of alcohol dissolves 15 vols. of gas; at 0°, 1 vol. of carbon disulphide dissolves 250 vols. of gas. The solutions in alcohol, ether, and benzene are less stable than those in water. The gas may be readily exploded by electric sparks or by heating strongly. When dry, the gas is relatively stable, but when once decomposition starts, the antimony which is deposited rapidly accelerates the action. Light and radium radiations appear to have no effect. The presence of moisture in any form enormously accelerates the decomposition. The liquefied hydride is unstable even at the ordinary temperature. Oxygen and air readily react with the gas at the ordinary temperature, yielding antimony, water, and usually a little free hydrogen. Nitric oxide is reduced to nitrous oxide, nitrogen, and ammonia. Ammonia or hydrogen chloride accelerates the decomposition of the gas into its components. The passage of electric sparks through a mixture of carbon dioxide and antimony hydride leads to the formation of antimony, water, and carbon monoxide. The halogens readily decompose the gas, also sulphur, the antimony haloids, oxidising or alkaline solutions, and all solid alkalis. It is best dried by means of calcium chloride or phosphoric oxide. No compound corresponding with AsH_3,BBr_3 (Abstr., 1901, ii, 382) has been obtained.

Gaseous antimony hydride is as strong a poison as arsenic hydride, and produces similar effects; white mice die after a few seconds exposure to an atmosphere containing 1 per cent. of the hydride.

A yellow modification of antimony may be obtained by leading a current of air or oxygen into the liquid hydride at −90°. It is extremely unstable, and at −50° is rapidly transformed into the ordinary metallic modification; it is also soluble in carbon disulphide at a little above −90°. J. J. S.

Mixtures of Antimony Trisulphide and Antimony. HENRI PÉLABON (*Compt. rend.*, 1904, **138**, 277—279).—Fused mixtures of antimony and antimony trisulphide form one or two liquid phases according to the ratio (R) of the antimony sulphide to the total mass of the mixture. When R is less than 0·015, the liquid is homogeneous, and consists of solutions of the trisulphide in antimony, the solidification temperatures of which decrease, as R increases, from 632°, the freezing point of antimony, to 615°, that of a saturated solution of antimony trisulphide in antimony. For values of R between 0·015 and 0·25, the liquid product of fusion consists of two phases, of which the less dense is a solution of antimony in the trisulphide, and the more dense a solution of the trisulphide in antimony; the solidification temperatures, 515° and 615°, of these two liquids remain sensibly the same for all values of R between the limits stated above. Finally, when R is greater than 0·25, the fused mixture is a homogeneous solution of antimony in the trisulphide, and the solidification temperature increases with R from 515° to 555°, the freezing point of the trisulphide. These results are in accordance with those obtained by the author in studying the action of hydrogen on antimony sulphide and of hydrogen sulphide on antimony (compare Abstr., 1900, ii, 352).

The two liquid phases exhibited by solutions containing the trisulphide in the proportions required by R = 0·015 to 0·25 are quite distinct, the less dense wets the glass and solidifies to a mass resembling stibnite, only less brittle, whilst the denser liquid does not wet the glass and solidifies to a metallic mass harder than pure antimony. M. A. W.

Mineralogical Chemistry.

Artificial Production of Krugite. A. GEIGER (*Chem. Centr.*, 1904, i, 604; from *Sitzungsber. K. Akad. Wiss. Berlin*, 1903, 1123—1124).—Attempts to produce krugite [$Ca_4MgK_2(SO_4)_6,2H_2O$] by the interaction of polyhalite [$Ca_2MgK_2(SO_4)_4,2H_2O$] and gypsum were without success. Crystals, which are probably orthorhombic, were obtained by the prolonged heating of a solution of magnesium chloride and potassium sulphate with gypsum. L. J. S.

Astrolite, a new Mineral. REINH. REINISCH. (*Centr. Min.*, 1904, 108—115).—The name astrolite (Astrolith) is given to small, greenish-yellow spheres (2—6 mm. diam.) with radially fibrous structure, which occur embedded, either singly or aggregated together, in fragments of black, carbonaceous rock in diabase-tuff at Neumark in Saxon Vogtland. The material has H. 3½, sp. gr. 2·78, and is not attacked by acids. The radially arranged fibres have a good cleavage in one direction, and are pleochroic; their optical characters suggest orthorhombic symmetry. Owing to enclosures of calcite, carbonaceous material, and wedges of the rocky matrix, pure material could not be obtained for analysis; from the following results, the metasilicate formula, $(Al,Fe)_2Fe(Na,K)_2(SiO_3)_5,H_2O$, is deduced. No water is lost below 200°

SiO_2.	Al_2O_3	Fe_2O_3.	FeO.	K_2O.	Na_2O.	H_2O.	$CaCO_3$.	Total.
50·44	7·88	12·62	11·62	5·03	6·40	2·74	3·88	100·61

A detailed description is given of the diabase-tuff and of the various rock fragments embedded in it. The astrolite occurs most frequently in a black, calcareous quartz-schist, but also in anthraconitic limestone and in a calcareous shale. L. J. S.

Formation of Tridymite in a Roofing Slate struck by Lightning. ARTHUR SCHWANTKE (*Centr. Min.*, 1904, 87—88).—Microscopic crystals of tridymite were detected in the glassy material which had been produced by the partial fusion of the roofing slate of a building struck by lightning. L. J. S.

Composition of Crystalline Schists from the Alps. PIERRE TERMIER and ANDRÉ LECLÈRE (*Compt. rend.*, 1904, **138**, 646—647).—Analyses are given of schists of various kinds from the Belledonne chain. Alkalis are present to the extent of 4—12 per cent., averaging 6 per cent. in the seven analyses; sodium is present as albite, and potassium as muscovite. These rocks having been formed by the regional metamorphism of sedimentary rocks (which contain only small amounts of alkalis), it follows that alkalis must have been introduced during the process of metamorphism. L. J. S.

Salinity of Waters from the Oolites. WALTER W. FISHER (*Analyst*, 1904, **29**, 29—40).—The results of the analyses are given of a considerable number of waters from the several geological formations grouped together as "oolites," namely: Kimmeridge clay, Corallian Oolite, Oxford clay and Kelloway Rock, and Cornbrash, Forest Marble and Great Oolite. The waters from the Great Oolite resemble spring waters from the chalk. The dissolved mineral matters are mainly calcium carbonate, with small amounts of magnesium and alkali sulphates and chlorides. The quantity of mineral matters in waters from below the Oxford clay varies considerably, according to the length of flow of the water through the porous beds under the clay. Some of these waters contain peaty matter in solution. As a rule, only small amounts of nitrates are found. The Corallian Oolites yield rather hard waters, containing but small quantities of organic impurities. The nitrates are very variable, depending on the state of the surroundings of the wells. Waters from the Kimmeridge clay are mostly extremely hard.

The results lead to the general conclusion that the uncovered beds of limestone yield calcareous waters of a hard character, whilst the deep beds, especially those covered by clay, give saline or alkaline supplies. The author suggests that the alkali carbonates owe their origin to the decay of organic matter deposited in or with the rock material, and that the ammonia and organic matters present in saline waters are also due to this organic matter. W. P. S.

Physiological Chemistry.

Absorption of Oxygen on Alterations of its Partial Pressure in the Alveolar Air. Arnold Durig (*Chem. Centr.*, 1904, i, 390—391; from *Arch. Anat. Physiol., physiol. Abth.*, 1903, 209—369).—The estimations show how widely the limits of proportion of oxygen in the inspired air may vary without materially affecting the amount of oxygen taken up by the organism, and the amount of carbon dioxide excreted. W. D. H.

Changes in Blood after Exercise. Philip B. Hawk (*Amer. J. Physiol.*, 1903, 10, 384—400).—Muscular exercise causes an increase in both red and white corpuscles. This is primarily due to the passage into the circulation of numbers of cells previously lying inactive in various parts of the body. W. D. H.

Glycerol in the Blood. Maurice Nicloux (*Compt. rend. Soc. Biol.*, 1904, 55, 1696—1697, 1698—1700. Compare Abstr., 1903, ii, 337, 438, 560, and this vol., ii, 56; also Mouneyrat, this vol., ii, 56).—Polemical; the author maintains the correctness of his former views against the criticisms of Mouneyrat. W. D. H.

Blood Coagulation. IV. The Coagulating Power of the Serum. Jules Bordet and Octave Gengou (*Ann. Inst. Pasteur.*, 1904, 18, 98—115).—Serum brings about the change of fibrinogen into fibrin in the absence of calcium salts; it excites the formation of ferment, this property depending on calcium salts. A number of other well-known facts are also confirmed. W. D. H.

Tryptic Digestion. Hans Richard Weiss (*Zeit. physiol. Chem.*, 1904, 40, 480—491).—The alkali haloids inhibit trypsin activity but little. The most marked effect is obtained with sodium chloride, less with potassium chloride, and less still with the corresponding iodine and bromine compounds. Sodium oxalate and sulphate act more strongly than the chloride. Sodium phosphate favours tryptic action, and borax has no effect. W. D. H.

Human Pancreatic Juice. Karl Glaessner (*Zeit. physiol. Chem.*, 1904, 40, 465—479).—A case in which an operation was performed on the pancreas rendered possible the collection of pancreatic juice. From 500—800 c.c. were secreted daily. It does not contain trypsin but its zymogen, which is rendered active by the intestinal juice. The steopsin and amylopsin were rendered more active by admixture with both intestinal juice and bile. Amylopsin acts on starch so as to form maltose; the conversion of this into dextrose is performed by the intestinal juice. Disaccharides are not acted on by pancreatic juice. During periods of fasting, the amount of juice, of contained ferments, and of alkalinity are at the minimum. They increase on taking a meal, reach their maximum four hours later, and then sink by the eighth hour after the meal to the fasting level. W. D. H.

Metabolic Experiments with the End-products of Peptic and Tryptic Digestion. Ernst J. Lesser (*Zeit. Biol.*, 1904, **45**, 497—510).—Dogs were fed on the product obtained by a 27 days' peptic digestion of Witte's peptone; this was given mixed with fat. In order to produce putting on of nitrogen or a maintainance of nitrogenous equilibrium, a much larger intake of nitrogen in this form is necessary than is ordinarily the case. The results of similarly feeding with the products of the pancreatic digestion of fibrin are still worse, and the probability is that these substances are not utilisable. The investigation shows little or no evidence of regeneration of proteid from its simplest hydrolytic products. W. D. H.

Emission of Blondlot's Rays [*n*-Rays] in the Course of the Action of Soluble Ferments. Lambert (*Compt. rend.*, 1904, **138**, 196—197. Compare Blondlot, *Compt. rend.*, 1903, **136**, 735, 1120, 1227, 1421; **137**, 166, 684, 729, 831, and Charpentier, *Compt. rend.*, 1903, **137**, 1049, 1277).—The digestive action of ferments on proteid matter is accompanied by an emission of *n*-rays, which can be detected by means of a screen of phosphorescent calcium sulphide, either directly or by photography. In one experiment, a portion of fibrin was placed in a tube containing pancreatic juice rendered active by kinase and kept at a temperature of 38°; the *n*-rays were emitted during the process of digestion, but ceased after the fibrin had disappeared. Similar results were obtained when the pancreatic juice was replaced by a dilute solution of pepsin in hydrochloric acid, whilst blank experiments with (1) hydrochloric acid, (2) hydrochloric acid and pepsin, (3) fibrin suspended in a 0·8 per cent. salt solution, gave negative results.

This particular case of emission of *n*-rays during fermentation falls into line with those observed by Blondlot (compare *Compt. rend.*, 1903, **137**, 962), the swelling of the fibrin by means of the acid setting up the necessary condition of constraint. M. A. W.

Calcium and Iron in Nutriment. Gustav von Bunge (*Zeit. Biol.*, 1904, **45**, 532—539).—A large number of analyses of the ash in various food-stuffs show that potassium, magnesium, and phosphoric acid are more abundant in most foods than in milk. Calcium, on the other hand, is most abundant in milk; the poverty of milk in iron is well known. For dietetic purposes, it is essential that such facts should be known. The way in which iron and calcium are combined is also important; there is some question whether inorganic iron is absorbed, and the calcium salts of ordinary water do not appear to be assimilable. The calcium in combination with caseinogen is easily displaced by dilute acetic acid in the cold; that combined with the other proteids is small in amount, and so loosely combined that it is displaced by a soluble oxalate. Lactose and citric acid perhaps assist the solution of calcium phosphate; the amounts of citric acid and calcium appear to be proportional. W. D. H.

Condition of the Body Proteïd in Inanition. EMIL ABDERHALDEN, PETER BERGELL, and THEODOR DÖRPINGHAUS (*Zeit. physiol. Chem.*, 1904, **41**, 153—156).—The yield of the proteids of the blood and body generally of mono-amino-acids was investigated by the ester method in animals in health and after inanition. No difference was found in the two cases. W. D. H.

Sugar Formation in the Liver. JOSEF SEEGEN (*Chem. Centr.*, 1904, i, 195; from *Arch. Anat. Physiol.*, *Physiol. Abth.*, 1903, 425—437).—As the sugar (dextrose) increases in the liver after removal from the body, the amount of glycogen falls, but not proportionately. In pieces of liver treated with alcohol (20—150 c.c. of absolute alcohol to 30 grams of finely-divided liver), sugar formation not only goes on, but more is formed than in pieces simply exposed to the air.

W. D. H.

Action of [Pilocarpine and Adrenaline (Epinephrine)] on the Hepatic Glycogen. MAURICE DOYON and KAREFF (*Compt. rend.*, 1904, **138**, 170—171).—After injection of pilocarpine hydrochloride into an intestinal vein of the dog, the glycogen in the liver diminishes or disappears; at the same time, the dextrose of the blood increases. Adrenaline has a similar effect. W. D. H.

The Simultaneous Existence in the Living Cell of Oxidising and Reducing Diastases; the Oxidising Property of Reductases. M. EMMANUEL POZZI-ESCOT (*Compt. rend.*,1 904, **138**, 511).—The author claims that the results obtained by Abelous and Aloy (compare Abstr., 1903, ii, 560; this vol., ii, 188) merely confirm his previous work (compare Abstr., 1902, i, 513, 580, 654, 655; ii, 635; 1903, i, 670). M. A. W.

Alcoholic Fermentation in Animal Tissues. JULIUS STOKLASA, F. ČERNÝ, JOH. JELÍNEK, EUGEN SIMÁČECK and EUGEN VÍTEK (*Pflüger's Archiv*, 1904, **101**, 311—339).—The presence of minute amounts of alcohol in animal tissues, blood, and organs has been frequently noted. Details are given of alcohol formation when various tissues are added to dextrose solution. This property depends on an enzyme and is not due to micro-organisms. W. D. H.

Influence of Electrolytes on Muscular Tone. WILLIAM D. ZOETHOUT (*Amer. J. Physiol.*, 1904, **10**, 372—377).—A full account of experiments previously published (this vol., ii, 190). W. D. H.

Influence of Veratrine and Glycerol on Muscular Contraction. ADALBERT GREGOR (*Pflüger's Archiv*, 1904, 101, 71—102).—The main effect of veratrine on the muscle curve is a great prolongation of the relaxation period. Glycerol produces a very similar effect, as has already been pointed out by Langendorff and Lyle. Details of numerous experiments illustrated by reproductions of muscle curves are given. W. D. H.

Relation of Ions to Ciliary Movement. RALPH S. LILLIE (*Amer. J. Physiol.*, 1904, 10, 419—443).—Pure solutions of sodium salts destroy cilia, but potassium and ammonium salts allow movement to continue for some time. The action of sodium salts is not prevented by addition of other anions. The majority of cathions exhibit antitoxic action, that is, enable movement to continue; this efficiency varies with the valency. The heavy metal cathions exhibit varying antitoxic efficiency, but the order appears to be that of the metals in the solution—tension scale. In dilutions of *N*/6400 to *N*/12800, the H ion exhibits well-marked antitoxic action. The quantity of a given cathion required to counteract the toxicity of a salt increases rapidly with an increase in the valency of the anion of that salt.
W. D. H.

Decomposition of the Nitrogenous Substances in Ascaris. ERNST WEINLAND (*Zeit. Biol.*, 1904, 45, 517—531. Compare Abstr., 1902, ii, 155, 412).—In fasting ascarides, the nitrogen excreted per diem is 15—20 mg. for every 100 grams of body-weight. If more nitrogen is found in the surrounding water, it leads to maceration of the animal. The nitrogen is excreted as ammonia and ammonia derivatives, not as nitrates, nitrites, or free nitrogen. W. D. H.

Influence of Hydroxyl and Hydrogen Ions on the Regeneration and Growth of Tubularia. JACQUES LOEB (*Pflüger's Archiv*, 1904, 101, 340—348).—In a neutral solution of sodium chloride, potassium chloride, calcium chloride, and magnesium chloride in the proportion in which these salts occur in sea water, the regeneration of amputated *Tubularia* polyps occurs more slowly than in sea water. The same is true for growth. If a small amount of sodium hydrogen carbonate or disodium hydrogen phosphate is added to the solution, the rate is increased to that in sea water. A small amount of sodium hydroxide has a similar, but smaller and stimulating effect, showing that during growth an acid is formed which inhibits growth. Certain algæ under the influence of light excrete alkaline substances which neutralise the acid in normal sea water. W. D. H.

Effects of Salts on Kidney Excretion and Glycosuria. ORVILLE H. BROWN (*Amer. J. Physiol.*, 1904, 10, 378—383).—Certain salts (sodium chloride, citrate, acetate, &c.) produce not only diuresis, but glycosuria also. The latter is prevented by small amounts of calcium or strontium chloride; these salts also decrease or inhibit phloridzin glycosuria. The salts that produce diuresis and glycosuria are also those that stimulate nerve. Anions stimulate and cathions depress renal activity. W. D. H.

Kidney Functions. II. Phloridzin Diuresis. OTTO LOEWI (*Chem. Centr.*, 1904, i, 398—399; from *Arch. exp. Path. Pharm.*, 50, 326—331).—Phloridzin causes great diuresis, but no increase in sodium chloride excretion; injection of dextrose increases the amount both of urine and sodium chloride. Phloridzin is regarded as an "indirect diuretic"; the sugar which passes into the urinary tubules hindering subsequent reabsorption of water. W. D. H.

Proteid Excretion through the Bile. AUGUST GÜRBER and B. HALLAUER (*Zeit. Biol.*, 1904, 45, 372—379).—The non-appearance in the urine of foreign proteids injected into the blood-stream is no proof that the proteid has been wholly or in part assimilated by the organism; the bile is a possible channel of excretion also. The neglect to examine the bile in most previous experiments of the kind renders a repetition of such work necessary. In the present experiments with casein, one third of the quantity injected was regained in the urine and bile; the excretion is, however, slow, and by prolonging the period of observation, it is probable that in time all the casein injected would have been recovered. There is no evidence that it is directly utilised by the body. W. D. H.

Absorption and Excretion of Certain Guaiacol Derivatives. TH. KNAPP and F. SUTER (*Chem. Centr.*, 1904, i, 391—392; from *Arch. exp. Path. Pharm.*, 50, 332—352).—The absorption of various guaiacol derivatives used in therapeutics appears to be good. The greater part is excreted in the urine as compounds with glycuronic acid.
W. D. H.

Electrical Conductivity of Urine in Relation to its Chemical Composition. JOHN H. LONG (*J. Amer. Chem. Soc.*, 1904, 26, 93—105).—It has been shown previously (Abstr., 1903, ii, 165) that the conductivity of urine due to metabolic products can be found by subtracting the conductivity due to the sodium chloride from the observed conductivity of the urine. Owing, however, to the fact that the conductivity of a pure aqueous solution of sodium chloride in absence of other salts is greater than the conductivity of the salt as it exists in the urine, a number of experiments have been carried out in order to ascertain the effect of other substances, namely, urea, ammonium sulphate, and disodium hydrogen phosphate, on the conductivity of sodium chloride solutions. The results of this investigation show that the conductivity of the constituents of urine other than sodium chloride may be found by diminishing the conductivity of a solution of sodium chloride of the same strength as that of the urine by about 3 per cent., and subtracting this corrected salt conductivity from the observed urine conductivity. E. G.

Urea and Urein. WM. OVID MOOR (*Zeit. Biol.*, 1904, 45, 420—463; 540—541. Compare this vol., ii, 192).—A full presentation of the author's much criticised views. W. D. H.

Nutrition Studies. IV. Composition and Energy Value of Flesh Fæces. JOHANNES FRENTZEL and MAX SCHREUER (*Chem. Centr.*, 1904, i, 199—200; from *Arch. Anat. Physiol.*, *Physiol. Abth.*, 1903, 460—479. Compare Abstr., 1901, ii, 609; 1902, ii, 216, 514).—In three dogs on a meat diet, the nitrogen in the fæces was 8·6 to 10·6, fat from 10·1 to 13·2, and ash from 14·1 to 22·1 per cent. In addition to undigested material, considerable amounts of residues from bile and mucous membranes are present. Full analytical details with estimation of heat values are given. W. D. H.

Alloxuric Bases in Aseptic Fevers. ARTHUR R. MANDEL (*Amer. J. Physiol.*, 1904, 10, 452—457).—In various surgical cases, fever occurs after an operation, although precautions to exclude infection are taken. The blood shows leucocytosis; the alloxuric bases and the uric acid in the urine vary inversely. A large excretion of alloxuric bases, presumably from the leucocytes, is accompanied by rise of body temperature. Injection of purine bases in men and monkeys causes fever. W. D. H.

[Acetone and Diabetes.] H. CHRISTIAN GEELMUYDEN (*Zeit. physiol. Chem.*, 1904, 41, 128—152).—Acetone production is regarded not so much as a perverted form of metabolism, as an exaggeration of a normal process. The blood of diabetic men and animals contains or yields much more acetone than in health. The same is true for various organs investigated; among the organs, the liver yields comparatively small amounts. The urine contains a much higher percentage than the blood. The main cause of increase in acetone is held to be carbohydrate inanition. In ordinary circumstances, acetone and carbohydrate enter into synthetical union. In fat metabolism, two main sets of intermediate products are formed, namely, carbohydrates and substances yielding acetone. Under normal conditions, the two antagonise each other. W. D. H.

Relations between the Molecular Weight and the Physiological Action of the Higher Fatty Acids. I. Myristic and Lauric Acids. LUDWIG F. MEYER (*Zeit. physiol. Chem.*, 1904, 40, 550—564).—These two acids, when given to dogs, are well absorbed; their soaps are found in small amount only in the fæces. They are true nutriments, and exercise a proteid-sparing influence, although not so fully as their higher analogues, the customary fatty acids (palmitic, oleic, stearic). The administration of benzene increases proteid katabolism. W. D. H.

Action of Anethole on the Organism. EUGÈNE VARENNE, J. ROUSSEL, and L. GODEFROY (*Compt. rend.*, 1903, 137, 1294—1296).—Anethole is not toxic, and it is probable that this substance will take its place as a therapeutic agent. W. D. H.

Action of Codeine. JACOB BOUMA (*Chem. Centr.*, 1904, i, 393; from *Arch. exp. Path. Pharm.*, 50, 353—360).—Daily injections of 0·2 to 0·4 gram of codeine phosphate for a long time were in dogs

excreted in great measure unchanged, from 77 to 89 per cent. being recovered in urine and fæces. The organism does not possess the power of destroying the alkaloid, and no habituation to its use is set up.
W. D. H.

The Effect of Phosphorus and Arsenic Poisoning on the Bile. Alfons Pilzecker (*Zeit. physiol. Chem.*, 1904, **41**, 157—175).—The bile was collected from a fistula in dogs. Both poisons are alike in producing the appearance of epithelial elements and a considerable quantity of albumin in the bile. The total amount of bile secreted is greater with phosphorus than with arsenic. Tables are given showing other less important changes in specific gravity, viscosity, colour, &c.
W. D. H.

Effect of Poisons after Adrenaline [Epinephrine] Injections. Alfred Exner (*Chem. Centr.*, 1904, i, 393; from *Arch. exp. Path. Pharm.*, **50**, 313—318).—After adrenaline is given intraperitoneally, strychnine and physostigmine produce toxic effects and death more slowly than in normal animals. This is attributed to the power adrenaline has of lessening the absorptive power of the alimentary tract. Subcutaneous injections of adrenaline led to inconclusive results.
W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Growth of Bacteria in Salt Solutions of High Concentration. Felix Lewandowsky (*Arch. Hygiene*, 1904, **49**, 47—61).—In the case of sodium chloride, the most concentrated solutions in which growth of bacteria took place contained 25 per cent. ($=4\cdot3$ mols.). Potassium salts have less effect, growth being very active in broth solutions saturated with potassium nitrate. This result accords with the very slight disinfecting power of potassium nitrate observed by Patterson.

Comparing relations of equal molecular concentrations, the results show that sodium salts act somewhat more strongly than potassium salts.
N. H. J. M.

Production of Acetylmethylcarbinol by the Bacteria of the Group Bacillus Mesentericus. Henri Desmots (*Compt. rend.*, 1904, **138**, 581—583).—The following bacilli, *Bacillus mesentericus vulgatus*, *B. fuscus*, *B. flavus*, *B. nijei* and *B. ruber*, were found to attack solutions of glycerol, mannitol, dextrose, sucrose, dextrin, inulin, and starch. Acetic acid, valeric acid, and small quantities of ethyl alcohol were produced in every case. By distilling the product, a lævorotatory solution was obtained which reduces Fehling's solution at the ordinary temperature and with excess of phenylhydrazine acetate gives a precipitate of the osazone of acetylmethylcarbinol. This osazone forms pale yellow, fern-like crystals melting at 243°.

S. S.

Chemistry of the Tubercle Bacillus. William Bulloch and J. J. R. Macleod (*J. Hygiene*, 1904, 4, 1—10).—On extraction with ether, dried tubercle bacilli yield large percentages of fatty substances. On filtering the boiling extracts, a white precipitate deposits on cooling. After saponification of the filtrate with sodium hydroxide, two extracts, aqueous and ethereal, are obtainable; the latter contains some fats; the fatty acids are probably oleic, *iso*cetic, and myristic. The aqueous extract contains a soap, the fatty acid of which corresponds in melting point with lauric acid. The filtrates also contain lipochromes. The white precipitate mentioned above can be saponified with difficulty by means of alcoholic potash; a white powder which is an alcohol is deposited, and the filtrate contains fatty acids.

W. D. H.

Two New Fluorescent Denitrification Bacteria. Harald R. Christensen (*Centr. Bakt. Par.*, 1903, 11, 190).—A description of two new organisms, *Bacillus denitrificans fluorescens* a, and *Bacillus denitrificans fluorescens* b.

A. McK.

Decomposition of Formic Acid by Micro-organisms. V. Omeliansky (*Centr. Bakt. Par.*, 1903, ii, 177—189, 256—259, 317—327).—*Bacillus formicicum*, isolated from the excrement of horses, has the property of fermenting a 2 per cent. solution of calcium formate containing 0·2 per cent. of peptone, the conditions being aerobic. Calcium formate is more suitable than sodium formate, since calcium carbonate is a product of the decomposition, thus, $Ca(CO_2H)_2 + H_2O = CaCO_3 + CO_2 + 2H_2$; further, by the use of calcium formate, the solution does not become alkaline, as is the case when sodium formate is used. The temperature was maintained at 35° and the growth extended over 1 to 2 weeks. *Bacillus formicicum* is described. The formic acid taken was not all attacked. The volatile acid in the mixture after the bacterial growth consisted almost entirely of formic acid together with a little acetic acid. The gases obtained by use of a culture of *B. formicicum* consisted of about 25·2 per cent. of carbon dioxide and 74·9 per cent. of hydrogen.

B. formicicum did not flourish when inoculated into solutions of acetic, propionic, and *n*-butyric acids respectively. Growth occurred in solutions of dextrose, galactose, lactose, mannitol, dulcitol, arabinose, and maltose, whilst none occurred with sucrose, starch, dextrin, inulin, gum-arabic, ethylene glycol, glycerol, and erythritol, the results being identical no matter whether the conditions were aerobic or anaerobic.

B. formicicum differs from *Bacillus methylicus*, with which it is morphologically similar, in not flourishing in a 0·5 per cent. aqueous solution of methyl alcohol.

The author has studied the action of *B. formicicum* on mannitol and contrasts his results with those of Frankland, Stanley, and Frew on the fermentation of mannitol with *Friedländer's Pneumococcus*

(Trans., 1891, **59**, 253) and those of Frankland and Lumsden with *Bacillus ethaceticus* (Trans., 1891, **60**, 432). The products obtained were: hydrogen, 1·2; carbon dioxide, 30·4; ethyl alcohol, 18·5; formic acid, 0·7, acetic acid, 3·8; and lactic acid, 45·4 per cent., the latter yielding a zinc salt with $[\alpha]$ +6·3° (c = 5·5). [The nature of the light employed is not mentioned.] When mannitol was fermented by *B. formicicum* in a 0·1 per cent. peptone solution, *i*-lactic acid was obtained instead of *l*-lactic acid; the yield of the lactic acid was in this case small, but a considerable amount of succinic acid was detected. The products obtained from dulcitol consisted of hydrogen, 1; carbon dioxide, 30·5; acetic acid, 11·2; formic acid, 0·5; *l*-lactic acid, 25·8; succinic acid (by difference), 31·0 per cent.; dextrose yielded *l*-lactic acid, whilst lactose yielded *i*-lactic acid. A. McK.

Separation of the Hydrogen Fermentation from the Methane Fermentation of Cellulose. V. Omeliansky (*Centr. Bakt. Par.*, 1904, **11**, 369—377. Compare Abstr., 1902, ii, 468).—Experiments are quoted on the fermentation of cellulose by the bacilli previously described. The separation of the hydrogen from the methane fermentation depends on the fact that the latter takes place at first when the culture is added; when the culture is, however, heated to 75°, the hydrogen fermentation takes place instead.

A. McK.

The Ferment present in "Harsh" or "Turned" Wine. J. B. Vincent Laborde (*Compt. rend.*, 1904, **138**, 228—231).—In a previous communication (compare *Compt. rend.*, 1898, **126**, 1223), the author had shown that the ferments which cause the "turning" of wine are analogous to the mannitic ferment of Gayon and Dubourg (compare Abstr., 1900, i, 784). Comparative experiments on the fermentative action of pure cultures of (1) Gayon and Dubourg's mannitic ferment, (2) the ferment from "turned" wine, (3) a ferment isolated from "turned" bottled wine, on sterilised white and red new wines, showed (1) that each of the three ferments had turned the wines, but that the action had proceeded much further in the case of the red than the white wine, and (2) that the third ferment was the most effective of the three as determined by the complete disappearance of the reducing sugar, and the large proportion of volatile acids (acetic and propionic) in the resulting product. The action of the three ferments on a solution of dextrose is identical, but they show a difference in their behaviour towards a solution of lævulose, the amount of mannitol formed being much less in the case of the third ferment than in the other two. M. A. W.

Yeast. J. J. Van Hest (*Chem. Centr.*, 1904, i, 394—395; from *Zeit. ges. Brauw.*, **26**, 701—706).—The paper treats of the influence yeast has on the nitrogen of the wort (which is *nil* unless the yeast cells die), and of the influence of temperature, oxygen, and attenuation through several generations on the production of zymase.

W. D. H.

Action of Sodium Fluoride on Yeast. MAURICE ARTHUS and JEAN GAVELLE (*Compt. rend. Soc. Biol.*, 1903, 55, 1481—1483).—Yeast in sugar solution is killed by sodium fluoride of one per cent. strength. Some cells resist longer than others, but their activity is lessened. W. D. H.

Influence of Strong Salt Solutions on the Force and Energy of Fermentation. ALB. J. J. VANDEVELDE (*Chem. Centr.*, 1904, i, 527—528; from *Handel. Vlaamsch. Natuur. en Geneeskundig Congres, Gent*, 27 Sept., 1903).—It has been shown (*Bull. Assoc. Belg. Chim.*, 16, 374) that strong solutions of non-poisonous salts have no influence on the fermenting force, that is, on the total quantity of carbon dioxide liberated by fermentation under certain conditions. The effect of such solutions on the energy of fermentation has been investigated in reference to temperature and the species of yeast. The energy of fermentation is defined as the number of hours required to convert three-quarters of the whole quantity of sugar into alcohol and carbon dioxide. The energy, like the force of fermentation, is independent of the osmotic pressure and concentration in the case of solutions of barium chloride, ammonium sulphate, magnesium sulphate, and zinc sulphate. There is also no relationship between osmotic pressure and energy of fermentation for solutions of potassium chloride, strontium chloride, potassium nitrate, sodium nitrate, ammonium nitrate, calcium nitrate, strontium nitrate, potassium phosphate, and ammonium phosphate, but with very concentrated solutions the energy decreases, but not proportionately to the concentration. The energy of fermentation appears to be connected with the osmotic pressure of solutions of sodium chlorate, ammonium chloride, calcium chloride, magnesium chloride, and magnesium nitrate, but varies in a very irregular manner. The influence of the salts does not appear to be of a physiological nature; they probably act more strongly on the zymase than on the yeast cells themselves. E. W. W.

Influence of Radium Rays on the Development and Growth of Lower Fungi. J. DAUPHIN (*Compt. rend.*, 1904, 138, 154—156).—Radium rays check the growth of the mycelium of *Mortierella*, and prevent the germination of the spores. The latter are, however, not killed, and germinate when again placed under normal conditions.
N. H. J. M.

Occurrence of Crenothrix Polyspora in Well Waters. ADOLF BEYTHIEN, HANS HEMPEL, and L. KRAFT (*Zeit. Nahr. Genussm.*, 1904, 7, 215—221).—The authors do not consider that the growth of *Crenothrix polyspora* depends on the ferruginous character of the water (Abstr., 1904, ii, 90), and show that some waters which are free from *Crenothrix* contain as much iron and organic matter as do other waters in which the algæ thrive. The growth appears to be more closely related to the amount of manganese salts in the water. In the analyses given, Knorre's method (Abstr., 1903, ii, 760) for estimating small quantities of manganese was employed. W. P. S.

Lipase in Cultures of Sterigmatocystis (Aspergillus). Charles Garnier (*Compt. rend. Soc. Biol.*, 1903, **55**, 1490—1492, 1583—1584).—Experiments are given which show the presence, illustrate the activity, and suggest the function in metabolic activity of lipase in certain fungi. W. D. H.

Assimilation of Alcohols and Aldehydes by Sterigmatocystis [Aspergillus] Nigra. Henri Coupin (*Compt. rend.*, 1904, **138**, 389—391).—Of the different substances employed, only ethyl alcohol, glycerol, erythritol, and mannitol are assimilable. Methyl alcohol and ethylene glycol are indifferent, amyl and allyl alcohols are slightly toxic, whilst propyl and amyl alcohols and phenol are distinctly toxic.

Formaldehyde, acetaldehyde, and benzaldehyde are non-assimilable or toxic. N. H. J. M.

Proteolytic Enzyme in Germinating Barley. Fr. Weis (*Chem. Centr.*, 1904, i, 385—386; from *Zeit. Ges. Brauw.*, **26**, 476—480, 497—500, 510—513, 539—542, 555—559, 587—591, 612—616, 630—633, 735—739, 791—795, 814—818, 834—838, 853—858, and 874—876. Compare Abstr., 1901, ii, 69).—Aqueous extracts of germinating barley contain two enzymes, probably peptase and tryptase, the action of which is retarded by thymol, chloroform, formol, benzoic acid, and salicylic acid. The peptic enzyme seems to be the less sensitive, at any rate, towards formol. Toluene has little effect on either. When the extract is precipitated with alcohol, the tryptic ferment is suppressed. The enzymes are almost equally soluble in water, dilute lactic acid, and glycerol, diffuse only slightly through animal membranes, and when dried withstand a temperature of at least 60°. Solutions are destroyed at about 70°. The tryptic, and probably the peptic, enzyme is not destroyed by freezing the malt extract. Light has very little effect, but the enzymes are very sensitive towards acids and alkalis. They are best preserved with toluene.

Tryptase acts on the following substances: malt, rye, and barley protein, casein, oat and wheat protein and legumin, the action increasing in degree in the order given. Egg albumin is very little changed by either enzyme.

Barley grain (not germinated) showed a very slight peptic, and no tryptic, action. The enzyme action appeared suddenly on the fourth day of germination and reached a maximum on the sixth day.

N. H. J. M.

Plants containing in their Seeds an Enzyme which Decomposes Fats into Glycerol and Fatty Acids. Sergius Fokin (*J. Russ. Phys. Chem. Soc.*, 1903, **35**, 1197—1204. Compare this vol., ii, 199).—The author has examined the seeds of 66 different plants, belonging to 31 families, for the presence of a fat-splitting enzyme. Such an enzyme occurs in the seeds of celandine and flax, and possibly of all plants of the genus *Linaria*. A table is given showing the percentage of oil contained in the seeds of *Xantium strumarium*, *Tilia parvifolia*, *Delphinium elatum*, *Evonymus verrucosus*, *Galeopsis ladanum*, and *Leonurus cardiaca*, and the constants of the different oils. The seeds of *Evonymus verrucosus* contain 43·64 per cent. of an oil, the constants of which, with the exception of the Reichert-Meissl number, are very nearly identical with those of sesamé oil.

The author concludes that the presence of the fat-splitting enzyme cannot be regarded as a characteristic of any particular family of plants. T. H. P.

Intramolecular Respiration in Higher Plants. A. J. Nabokich (*Chem. Centr.*, 1904, i, 194; from *Ber. deut. bot. Ges.*, **21**, 467—476).—As regards the intramolecular respiration of seeds which do not contain fermentable carbohydrates, and the effect of non-fermentable substances such as peptose, asparagine, and organic acids, &c., it was found that two modifications exist. Pure alcoholic fermentation takes place in dextrose cultures and partially in mannitol, the relation of carbon dioxide to alcohol being 100 : 104·4. Organic acids are found in small quantity. Alcoholic fermentation with utilisation of organic acids was found to take place when the seeds suffered from want of fermentable carbohydrates. The utilisation of organic acid was very decided in the case of lactic acid cultures.

Peptone was very favourable to intramolecular respiration.

N. H. J. M.

Stimulants of Plant Growth and their Practical Employment. Oscar Loew (*Bied. Centr.*, 1904, **33**, 91—94; from *Landw. Jahrb.*, 1903, **32**, 437. Compare Abstr., 1903, ii, 322 and 323).—Small amounts of manganese sulphate increased the yield, provided that the manuring was normal, the effect varying with different families of plants. Cruciferous plants seem to be much more sensitive than *Gramineæ*. In the case of rice, the relation of grain to straw was improved by manganese in addition to the yield being increased.

Uranyl nitrate increased the yield both of oats and of peas. Similar results were obtained with sodium fluoride and potassium iodide. Iron sulphate had a slight effect on oats.

The seeds of stimulated plants were in every respect normal.

N. H. J. M.

Emission of Water by Plants and their Spontaneous Desiccation. Marcellin Berthelot (*Compt. rend.*, 1904, **138**, 16—29).—The loss of water was determined at intervals in the separated green parts and roots of *Festuca*, in the entire plant freed from soil, in the entire plant with soil, and in a sample of the soil alone.

The spontaneous drying at the ordinary temperature was complete in a few days, and followed a law of proportionality to the weight of expressible water which remained at each instant in the plant. A certain amount of water remains which can only be expelled at a higher temperature. The water which is given off at the ordinary temperature cannot be restored by contact of the plant with moist air, but only (if the drying has not gone too far) by the application of water or contact with air saturated with moisture. N. H. J. M.

Storage of Nitrates in Plants. N. K. NEDOKUCHAEFF (*Chem. Centr.*, 1904, i, 193—194; from *Ber. deut. bot. Ges.*, 1903, 21, 431—435).—The amounts of nitrates stored by seedlings of *Helianthus annuus*, *Cucurbita Pepo*, *Phaseolus multiflorus*, and *Zea Mays*, grown in Knop's solution with different amounts of nitrate, varied according to the species and with the concentration of the solution. The accumulation of nitrates increases with the strength of the solution up to a certain point, which varies with different plants. The amount taken up also depends on the base, being greatest in presence of potassium nitrate. Any potassium salt will increase the amount of nitrates in the plants.

Plants in an atmosphere saturated with moisture take up less nitrate, and smaller amounts are stored by etiolated plants than in presence of light. N. H. J. M.

The Entrance of Metallic Elements in Plants. OSCAR LOEW (*Pflüger's Archiv*, 1903, 100, 335—336).—Bokorny showed that in plant life the place of one element cannot be taken by another. This rule is confirmed, but has one exception; in some lower fungi, rubidium can take the place of potassium. W. D. H.

Normal Occurrence of Salicylic Acid in Certain Plants of the Violaceæ. ALBERT DESMOULIÈRE (*J. Pharm. Chim.*, 1904, [vi], 19, 121—125. Compare Abstr., 1902, ii, 40).—Many plants of this order yield methyl salicylate, which probably results from the hydrolysis of a glucoside analogous to gaultherin, on distillation in a current of steam. The glucoside has not, however, been obtained in a crystalline form. Cherries contain salicylic acid in amounts varying from 0·1 to 0·21 mg. per kilo., and the acid is present in *Calendula officinalis* to the extent of 0·43 mg. per kilo. G. D. L.

Hexone Bases in the Tubers of Potatoes and Dahlia. ERNST SCHULZE (*Landw. Versuchs-Stat.*, 1904, 59, 331—343).—Both histidine and lysine occur in potato tubers, and arginine in potatoes and dahlia. This lends support to the view that the mixture of crystallising nitrogenous substances present in roots and tubers is very similar in composition to that found in etiolated seedlings. N. H. J. M.

Formation of Terpenic Compounds in Chlorophyll Organs. EUGÈNE CHARABOT and ALEXANDRE HÉBERT (*Compt. rend.*, 1904, 138, 380—381).—The suppression of inflorescence resulted in an increased production of stem (of peppermint) and an increase in the amount of essence (both per cent. and actual) in the green portions. The terpenic compounds are therefore produced by the chlorophyll organs. In absence of light, the production is greatly reduced. N. H. J. M.

Effect of Oil of Turpentine on the Changes in the Proteids in Plants. MARIE LESCHTSCH (*Chem. Centr.*, 1904, i, 194—195; from *Ber. deut. bot. Ges.*, 21, 425—431).—The production of proteids in wounded bulbs of *Allium cepa* and *A. ascalonium* was increased by small amounts of turpentine vapour, but hindered by large amounts.

Entire bulbs were not affected. In wheat seedlings, the decomposition of proteids was perceptibly checked by oil of turpentine. Both the bulbs and the seedlings are killed by large amounts of oil of turpentine.
N. H. J. M.

Existence in Plants of an Oxidising-reducing Diastase. J. E. ABELOUS and JULES ALOY (*Compt. rend.*, 1904, **138**, 382—384).—It was found that vegetable sap contains an oxidising-reducing diastase similar to that found in animal organs (Abstr., 1903, ii, 560; this vol., ii, 188). In the case of plants, however, the activity of the ferment is suppressed by oxydases of the laccase type. The oxidising action may be shown by adding potassium chlorate, for example. N. H. J. M.

Composition of the Fatty Oil of Aspidium Spinulosum. P. FARUP (*Arch. Pharm.*, 1904, **242**, 17—24).—The oil was prepared by extracting with ether a powder which had been left after an extract of the rhizomes had been mixed with calcined magnesia and extracted with water, to remove filicic acid and allied substances. It consisted mainly of olein. In addition to oleic acid and glycerol, phytosterols, linolic acid (forming about 4 per cent. of the liquid acids), solid fatty acids (in amount too small to admit of separation), a little butyric acid, and probably *iso*linolenic acid were detected. The liquid acids were detected by dissolving the mixture of them in aqueous potassium hydroxide, oxidising the solution with potassium permanganate in the cold, and identifying the hydroxy-acids formed. Katz (Abstr., 1899, ii, 324) did not find phytosterol in *Aspidium Filix mas.* C. F. B.

Toxicology of Agaricus Muscarius. ERNST HARMSEN (*Chem. Centr.*, 1904, i, 384—385; from *Arch. exp. Path. Pharm.*, **50**, 361—452).—The amount of muscarin in an extract and in the original fungus can be approximately determined by the effect on frogs and cats, 0·05 mg. of the pure substance stopping the action of a frog's heart. The same effect is produced in the case of cats with half this amount. It was found that the fresh substance of the fungus contained 15 per cent. of muscarin. Poisoning by muscarin and by the fungus are, however, not identical, as the fungus contains a second poison, which is extracted by water from the residue left after extracting the muscarin with alcohol. The second poison is an unstable substance which diminishes in quantity when the fungus is dried. N. H. J. M.

Toxic Action of Acids and Salts on Seedlings. FRANK K. CAMERON and J. F. BREAZEALE (*J. Physical Chem.*, 1904, **8**, 1—13).—The concentration of solutions of various acids, potassium and calcium salts, which caused death of small seedlings of maize, wheat, and clover were determined. In the case of the latter plant, the value found was the same for all the acids, namely, $N/20000$, so that here the toxic effect appears due to the hydrogen ion. For maize, however, the values varied from $N/600$ to $N/3000$, and for wheat from $N/15000$ to $N/20000$. The concentrations required for the salts were considerably higher, varying from about $N/100$ for potassium carbonate to about $N/5$ for calcium chloride. Addition of potassium salt was found also to decrease the toxic effect of the acids on maize and wheat, but apparently increases its effect on clover; calcium salts, however, decrease the toxic effect of acids on all the seedlings. Although the author does not consider the results are opposed to the dissociation theory, yet they make it evident that toxic effect cannot be regarded as simply an ionic property. L. M. J.

The Carbohydrates of Barley and their Changes during Germination. LÉON LINDET (*Chem. Centr.*, 1904, i, 383 384; from *Ann. Brass. Dist.*, 1903, 289—295, and *Zeit. ges. Brauw.*, **26**, 641—645).—Barley contains amylan and galactan besides sucrose and dextrose. During germination, the galactan and sucrose increase, the latter yielding invert sugar, of which the lævulose is more rapidly utilised than the dextrose, especially at the commencement of germination. Maltose or dextrin are never found. The starch is converted into sucrose, either directly or with production of maltose (Brown and Morris), as unstable intermediate product. Conversion of sucrose into starch was often established.

It is uncertain whether galactan is formed from starch; it is certainly not derived from cellulose. N. H. J. M.

Pentosans as Constituents of Foods, especially Rye Straw. ALBIN VON RUDNO RUDZINSKI (*Zeit. physiol. Chem.*, 1903—1904, **40**, 317—390).—The results of experiments with rye showed that the various manures employed had no effect on the percentage of pentosans in the straw. The amount in the dry matter of the straw was 27·07—27·92 per cent. The pentosans vary in quantity in the different parts of the straw, being lowest (26·52 per cent.) in the lowest third and increasing upwards; the ear spindles contained 33·03 per cent.

As regards the digestibility of the pentosans of rye straw fed in conjunction with moderate amounts of readily soluble carbohydrate, it was found that sheep digested 46·66—46·99 per cent. The digestibility was increased (to 70·2 per cent.) by digesting the straw with water (three parts) containing sodium hydroxide (3—4 per cent. of the weight of the straw) for 6 hours under 6 atmospheric pressures (Lehmann, *Deut. landw. Presse*, **29**, 445).

In presence of excessive amounts of readily soluble carbohydrates, the digestibility of the pentosans was much diminished, but not to the same extent as that of the crude fibre. N. H. J. M.

Pot Experiments on the Effect of Liming and Marling on the Yield of Serradella RICHARD ULBRICHT (*Landw. Versuchs-Stat.*, 1904, **59**, 425—432. Compare Abstr., 1903, ii, 240).—The greatest yield was obtained after applying a very small amount of nitrogen, together with phosphoric acid and potassium, notwithstanding the small amount of lime in the soil. Lime, marl, and even limestone meal diminished the yield, but the effect of lime was much the greatest.

The injurious effect of exclusive application of marl to soil deficient in all manurial constituents, previously observed in the case of vetches, was also noticed in the experiments on serradella.

N. H. J. M.

Manurial Experiments with Tobacco. MAX LEHMANN and S. TOBATA (*Landw. Versuchs-Stat.*, 1904, 59, 443—472. Compare Abstr., 1903, ii, 681).—A number of pot experiments on the effect of various manures on tobacco grown in Japanese soils are described. Both wood ash and straw ash gave good results and acted favourably on the burning qualities of the tobacco. Soy bean meal also gave good results, being at least equal to rape cake, although the percentage of water in the beans was somewhat increased. Sodium nitrate had a similar effect. Fish guano injured the quality of the tobacco.

N. H. J. M.

Influence of Soil Moisture on the Composition of Certain Plant Parts. JOHN A. WIDTSOE (*J. Amer. Chem. Soc.*, 1903, 25, 1234—1243).—The composition of plants and of parts of plants is greatly influenced by the amount of water in the soil, the constituents which show the greatest variations being the proteids and the non-nitrogenous extract. The proteids increase when the supply of water is diminished, whilst the non-nitrogenous extract and the fat decrease.

The following summary shows the differences between the highest and lowest percentages in dry matter, due to varying amounts of soil moisture :

	Proteids.	Fat.	Non-nitrogenous extract.	Starch.
Maize kernels...	2·56	0·90	2·33	—
Oat " ...	5·31	0·68	1·69	—
Wheat " ...	11·46	1·78	12·43	—
Potatoes	4·24	—	5·70	6·93
Sugar-beet	4·88	—	5·05	—

N. H. J. M.

Rennet Enzyme as a Cause of Chemical Changes in the Proteids of Milk and Cheese. LUCIUS L. VAN SLYKE, H. A. HARDING, and EDWIN B. HART (*J. Amer. Chem. Soc.*, 1904, 25, 1243—1256).—The results of experiments with milk and cheese showed that there was little or no proteolytic action of either rennet enzyme or commercial pepsin except in presence of acid. Paracasein monolactate is formed in milk and curd in the presence of acid, and proteolysis takes place, with the rennet ferment as the active agent. The chemical work of both rennet enzyme and commercial pepsin is chiefly confined to the production of paranuclein, caseoses, and peptones ; no ammonia is formed and only traces of amides.

In normal cheese, the amounts of amides and ammonia increase with age, whilst the compounds previously formed diminish. The first stage in normal ripening is a peptic digestion of paracasein monolactate ; then amides are gradually formed and later on ammonia.

When rennet enzyme was the only digesting agent present in cheese, no trace of cheese flavour could, in any case, be detected.

N. H. J. M.

Influence of the Carbon Dioxide of the Soil on Vegetation. Ém. Demoussy (*Compt. rend.*, 1904, 138, 291—293).—The results of pot experiments with lettuce showed that sterilised soil gave as good results as normal soil when the composition of the surrounding air was rendered similar, by placing sterilised and unsterilised soil under the same bell-jar, and that sand in normal air gave the same results as sterilised soil.

The conclusion is drawn that the organic matter of the soil does not directly act as plant food. It is probable that short plants are benefited by the carbon dioxide liberated from the soil.

N. H. J. M.

Distribution of Potassium in Arable Soil. J. Dumont (*Compt. rend.*, 1904, 138, 215—217).—The amounts of potash were determined in the mechanically separated portions of Grignon soil and a granite soil from La Creuse. The following results were obtained :

	K_2O per cent. in dry soil.		Per cent of total K_2O.	
	Grignon soil.	La Creuse soil.	Grignon soil.	La Creuse soil.
Coarse sand...	0·148	0·605	16·55	70·93
Fine sand......	0·588	0·225	65·78	26·37
Clay	0·158	0·023	17·67	2·70

The supposition that the chemical activity of a soil depends mostly on the fine particles accords with the fact that potassium manures are generally inefficacious in the case of Grignon soils, and act favourably on the granitic soils.

N. H. J. M.

Organic Matter in Soils and Sub-soils. Frank K. Cameron and J. F. Breazeale (*J. Amer. Chem. Soc.*, 1904, 26, 29—45).—The chromic acid method is recommended for estimating carbon in soils, and it was found more convenient to include the carbon present as carbonates than to treat the soil with sulphurous acid, the carbonates being determined separately and the amounts deducted from the total carbon.

The results of a considerable number of estimations of carbon in extracted humus showed an average of 42 per cent., instead of 56 per cent., the figure adopted by Wollny, Wolf, van Bemmelen and others. It is not, however, considered desirable to make any alteration in the factor for the present.

The ash of humus was, in one case, mainly lime, but as a rule it consisted chiefly of iron oxides, alumina and silica ; manganese was, in several cases, found in considerable quantity.

N. H. J. M.

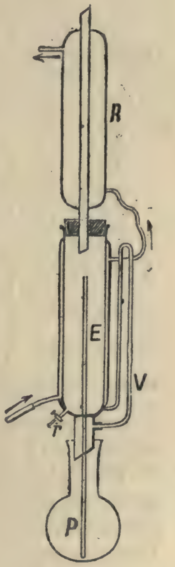
Solubility of Phosphorite under the Influence of Physiologically-acid Salts. J. W. Schuloff (*Bied. Centr.*, 1904, 33, 79—80 ; from *J. exper. Landw.*, 1902, 3, 711—719).—The results of pot experiments with barley showed that much larger yields are obtained when a mixture of phosphorite and ammonium salt is used as manure, than when the two substances are separated. This is attributed to the action of the acid of the ammonium salt on the phosphorite

N. H. J. M.

Analytical Chemistry.

Apparatus for the Continuous Extraction of Liquids. Arturo Pelizza (*Chem. Zeit.*, 1904, 28, 186).—The solution to be extracted is introduced into *E*, and into *P* is brought a sufficiency of the solvent (ether, benzene, light petroleum). When this is boiled, it passes as vapour through the tube *V* into *E*, where it is condensed by aid of the jacket, and then collects at the top. It then runs back through the central tube into *P*, where it is again vaporised; and so the process goes on for any desired length of time. The condenser *R* completes the condensation of the vapour. The stop-cock, *r*, serves for the emptying of the apparatus and the control of the extraction process.

L. de K.



Nephelometer, an Instrument for Detecting and Estimating Opalescent Precipitates. Theodore W. Richards and Roger Clark Wells (*Amer. Chem. J.*, 1904, 31, 235—243).—The nephelometer was devised by Richards (*Proc. Amer. Acad.*, 1894, 30, 385) for estimating the precipitate in opalescent liquids containing not more than 0·001—0·002 gram per litre. The method depends on the fact that these finely divided precipitates reflect light, the intensity of which is a function of the quantity of the precipitate.

A modification of this apparatus is now described in which the prisms are so arranged that the images to be compared are brought side by side, and very small amounts of suspended precipitates can therefore be estimated with ease and accuracy. The chief source of error lies in the state of the precipitate, and in order to exclude variation the solution to be estimated and the standard solution for comparison should be precipitated in exactly the same way.

E. G.

New Gasvolumeter. J. Gruszkiewicz (*Zeit. anal. Chem.*, 1904, 43, 85—91).—This instrument avoids the inconveniences caused by the performance of the reaction in the gas burette itself, and those resulting from the use of caoutchouc for connecting a reaction flask with the eudiometer. The general plan of the apparatus is that of

Lunge's gasvolumeter, but the reaction vessel, which consists of two concentric glass cylinders, the inner one being open at the bottom and stoppered at the top, whilst the outer one has a stop-cock at the bottom and a side burette for admitting reagents, is connected with the top of the eudiometer by a glass tube. Mercury is drawn into the reaction vessel before commencing an analysis, and the agitation of the liquids is entirely effected by raising and lowering the mercury reservoir. The apparatus can be employed for all analyses involving the measurement of a gaseous product. M. J. S.

Determination of the Reaction of a Liquid by means of Indicators. HANS FRIEDENTHAL (*Zeit. Elektrochem.*, 1904, 10, 113—119).—The "reaction" of a solution, or the concentration of the hydrogen ions in it, is determined by adding an indicator and comparing the colour produced with that given with a solution of known concentration. The following series of standard solutions is used, the concentrations being given in gram-equivalents per litre.

Concentration of H ions.	Concentration of solution.	Concentration of H ions.	Concentration of solution.
2	6·034 HCl	1×10^{-8}	0·000001 KOH or
1	1·35 HCl		0·00204 aniline
1×10^{-1}	0·103 HCl	1×10^{-9}	0·00001 KOH or
1×10^{-2}	0·01007 HCl		0·204 aniline
1×10^{-3}	0·001 HCl	1×10^{-10}	0·0001 KOH
1×10^{-4}	0·0001 HCl	1×10^{-11}	0·001 KOH
1×10^{-5}	0·00001 HCl or	1×10^{-12}	0·0102 KOH
	0·0588 boric acid	1×10^{-13}	0·104 KOH
1×10^{-6}	0·000001 HCl or	1×10^{-14}	1·38 KOH
	0·000588 boric acid	1×10^{-15}	3·8 KOH
1×10^{-7}	pure water		

The neutral solution may also be made up in a number of other ways, one of which is described later. The indicators used are given in the following list; 0·1 c.c. of a solution containing 0·01 gram molecule per litre is added to 10 c.c. of the solution to be tested and the colour compared by transmitted light with the standard solutions. Indicators suitable for the most acid solutions stand at the beginning of the list: tropaeolin, neutral-red, methyl-violet, methyl-orange, Congo-red, lacmoid, litmus, gallein, rosolic acid, *p*-nitrophenol, sodium alizarinsulphonate, neutral-red, tropaeolin, phenolphthalein, *a*-naphtholbenzoin, sodium alizarinsulphonate, gallein, Poirrier's blue, methyl-violet, gallein. When an indicator is mentioned twice, it indicates that it gives two changes of colour.

It is stated that acid solutions always give correct results with acid indicators and alkaline solutions with basic indicators, whereas slightly acid (or alkaline) solutions give variable results with basic (or acid) indicators owing to the formation of salts, especially when the solution contains weak electrolytes. A useful set of standard solutions for comparison with nearly neutral solutions of weak electrolytes is obtained by mixing $N/10$ solutions of (*a*) Na_2HPO_4 and (*b*) NaH_2PO_4; a solution containing 2 c.c. of (*a*) and 8 c.c. of (*b*) is almost exactly neutral. These solutions are especially applicable to the determination of the reaction of the fluids contained in the animal body, several of which, previously supposed to be alkaline, are found to be almost absolutely neutral. T. E.

New Titration Apparatus. HEINRICH FRINGS (*Chem. Centr.*, 1904, i, 606—607; from *Deutsche Essig Industrie*, 8, 10—12).—A complex apparatus devised for those works where a large number of titrations of the same kind have to be performed. The main feature of novelty is that a single tap suffices for the measuring pipette, the burette, and the connection between the latter and the stock bottle. L. DE K.

Volumetric Analysis. GEORG LUNGE (*Zeit. angew. Chem.*, 1904, 17, 195—203, 225—236, 265—270. Compare Abstr., 1903, ii, 389).—An exhaustive criticism of several volumetric methods, too lengthy for useful abstraction.

The article comprises: errors due to glass vessels; the true litre and its sub-divisions; action of caoutchouc and vaselin on iodine and permanganate; reading of burettes. *Indicators.*—Phenolphthalein; nitrophenols; iron salicylate. *Standard salts for alkalimetry and acidimetry.*—Potassium di-iodate; potassium tetraoxalate; sodium tetraoxalate; sodium carbonate. *Iodometry.*—Starch solution; comparison of sodium thiosulphate and arsenious oxide towards iodine solution; potassium di-iodate as standard salt in iodometry; standardisation of iodine with sodium sulphite. *Standard salts for checking permanganate solutions.*—Oxalic acid; oxalates; metallic iron; hydrogen peroxide. *Comparison of results.* L. DE K.

Estimation of Moisture in Nitroglycerol Explosives. ARTHUR MARSHALL (*J. Soc. Chem. Ind.*, 1904, 23, 154—155).—The cordite or other explosive is ground in a small mill and that portion selected for analysis which passes through a sieve having holes of the size of No. 8 wire gauge, but not through one with holes equal to No. 14 wire gauge. Five grams of this material are placed in an aluminium dish $2\frac{1}{4}$ inches in diameter and $\frac{5}{8}$ inch in depth. The dish is surmounted by a flange or collar on which rests a glass cone $4\frac{1}{4}$ inches in height. Small spaces are left between the cone and flange for the passage of the water vapour. After weighing the whole apparatus and its contents, it is placed on a metal plate over a water-bath until all water is driven off, then cooled in a desiccator, and re-weighed. For ordinary cordite, 1 hour's heating is sufficient; but for cordite containing 65 per cent. or more of gun-cotton, 2 hours or longer are required to drive off the moisture. W. P. S.

Estimation of Fluorine in Fluorides. A Critical Examination of the Wöhler-Fresenius Method. KARL DANIEL (*Zeit. anorg. Chem.*, 1904, 38, 257—306).—As the results of his investigations, which include a large number of actual experiments, the author comes to the conclusion that the fluorine is quantitatively converted into silicon tetrafluoride in this method. Good results may be obtained if the conditions are adhered to. In some cases, where the excess of anhydrous silica is large, a non-volatile substance is formed to some extent.

A method is given for the detection of fluorine. The substance to be tested is mixed with quartz powder and placed in a test-tube. The latter is closed by a cork through which passes a glass rod, reaching almost to the bottom of the tube and slightly enlarged at its lower end. This knob is painted black and a drop of water is placed on it. On adding sulphuric acid and warming cautiously, a white film forms on the surface of the drop of water, should fluorine be present. The glass rod may be of such a size that it almost touches the sides of the test-tube, thereby diminishing the internal space of the latter. 0·1 mg. of fluor-spar can be detected by this test. Conversely, the test serves for the detection of silicates. It is necessary, however, to fuse the silicate with a mixture of sodium and potassium carbonates, before applying the test. The addition of a little magnesite is advisable, to give a steady evolution of carbon dioxide in the test-tube and bring the silicon tetrafluoride more rapidly in contact with the drop of water.

W. P. S.

Volumetric Estimation of Sulphurous Acid. JOHANNES PINNOW (*Zeit. anal. Chem.*, 1904, **43**, 91—96).—It has been stated that a mixture of sulphite and thiosulphate can be analysed by titrating one portion with iodine and another with permanganate, on the assumption that both sulphurous and thiosulphuric acids are completely oxidised to sulphuric acid by permanganate. This is not the case. An indefinite portion, about 15 per cent., of the sulphurous acid is oxidised to dithionic acid. The oxidation proceeds somewhat further in strongly alkaline solutions, but is still incomplete. It is moreover affected by dilution. The titration of sulphurous acid by iodine is also influenced to some extent by the degree of dilution, being incomplete if the solution is too concentrated. M. J. S.

Estimation of Phosphorus in Phosphorus-oil and Similar Preparations. JULIUS KATZ (*Arch. Pharm.*, 1904, **242**, 121—138).—Of the phosphorus-oil 10·0 grams are shaken vigorously with 20 c.c. of 5 per cent. aqueous copper nitrate until a permanent black emulsion is obtained. Then 50 c.c. of ether are added, and hydrogen peroxide (about 10 c.c.), little by little, with constant shaking, until the black colour has disappeared entirely. The aqueous liquid is then run off, the ether washed 3 times with 10—20 c.c. of water, and the united aqueous liquids evaporated to 10—20 c.c. on the water-bath after the addition of a few drops of hydrochloric acid. The residue is filtered from drops of oil, ammonia is added to it until the precipitate which forms at first has redissolved; the phosphoric acid is then precipitated with magnesia mixture and weighed in the usual manner.

The method is a modification of Straub's (Abstr., 1903, ii, 691). The hydrogen peroxide effects a much more rapid oxidation of the black copper phosphide than air does. The ether further promotes this action, and in addition it accelerates the separation of the aqueous layer. As the only metal present is copper, which is not precipitated by excess of ammonia, preliminary precipitation of the phosphoric acid with molybdate is unnecessary. Copper sulphate must not be used, as the precipitate is then contaminated with basic magnesium salts. Test estimations with solutions of phosphorus in olive oil and in carbon bisulphide, about 0·5 per cent. in strength, gave errors of only – 0·7 to – 1·1 per cent. of the total amount, which was 0·08—0·05 gram in each experiment.

The composition of the black precipitate of copper phosphide corresponds approximately with the formula Cu_2P_2.

Various oils were saturated at the ordinary temperature by shaking them for 1—2 hours with liquefied phosphorus; the percentages of phosphorus then contained in them was found to be as follows: oil of almonds, 1·13; olive oil, 1·08; oil of sesamé, 1·06; oil of arachis, 1·20; rape-seed oil, 1·16; cod liver oil, 1·13; oil of poppies, 1·11; linseed oil, 1·15; castor oil, 0·70; paraffin oil, 1·33.

The method cannot be used to estimate the percentage of phosphorus in an alcoholic solution, the error being – 30 per cent. or more. Saturated solutions in 90 per cent. and in absolute alcohol probably contain more than 0·1 and 0·2 per cent. of phosphorus respectively. C. F. B.

Electrolytic Estimation of Arsenic. SAMUEL R. TROTMAN (*J. Soc. Chem. Ind.*, 1904, 23, 177—179).—The apparatus used is similar to that described by Thorpe (Trans., 1903, 974). The cell employed is made of glass, with a parchment-paper diaphragm, the upper end of the cell being fitted with a rubber bung through which pass the tap, funnel, and electrode. An outer vessel of water surrounds the cell in case the diaphragm bursts. The apparatus will detect 0·000001 gram of arsenious oxide. W. P. S.

Estimation of Arsenic in Sulphuric and Hydrochloric Acids. N. G. BLATTNER and J. BRASSEUR (*Chem. Zeit.*, 1904, 28, 211).—An application of the process devised by Seybel and Wikander (Abstr., 1902, ii, 289).

Arsenic in hydrochloric acid.—Fifty c.c. of the sample, which should, if necessary, be brought to a sp. gr. of about 1·18 by judicious addition of sulphuric acid of sp. gr. 1·45, are mixed with 5 c.c. of a 30 per cent. solution of potassium iodide, and after waiting for one minute the liquid is filtered through glass wool. After washing the precipitate with a few c.c. of pure hydrochloric acid containing 10 per cent. of the potassium iodide solution, the arsenic tri-iodide is dissolved in water, and after adding a slight excess of sodium hydrogen carbonate, the arsenious acid formed is titrated as usual with $N/10$ iodine solution.

Arsenic in sulphuric acid.—The acid should first be diluted to a sp. gr. of 1·45. Twenty-five c.c. of the sample are then mixed with 25 c.c. of pure hydrochloric acid and 5 c.c. of potassium iodide solution, and further treated as above. In calculating, due allowance must be made for any dilution the samples have undergone. L. DE K.

Volumetric Estimation of Arsenic and Antimony in Nickel Ores. H. NISSENSON and ALWIN MITTASCH (*Chem. Zeit.*, 1903, 28, 184—186).—0·5 gram of the ore is heated with 8 c.c. of strong sulphuric acid on a sand-bath for some hours until the mass has assumed a white or yellowish-white colour. It is then boiled with 100 c.c. of water and at once treated with hydrogen sulphide. The precipitate is collected and washed, and again heated with 7 c.c. of sulphuric acid for some hours until all the sulphides have dissolved. The residue is then dissolved in 100 c.c. of boiling water, and the joint arsenic and antimony titrated with $N/10$ potassium bromate, using indigo as indicator (Abstr., 1903, ii, 697).

The liquid is mixed with a little more bromate solution, concentrated by evaporation, 1 gram of tartaric acid is added, then ammonia, and finally 30 c.c. of magnesia mixture. After the arsenic has precipitated, the filtrate is concentrated, acidified with sulphuric acid, and treated with hydrogen sulphide. The precipitate is washed, redissolved in hot sulphuric acid, and the resulting solution titrated with potassium bromate as already described. This gives the antimony only, and the arsenic is found by difference. The results are sufficiently accurate for technical purposes. L. DE K.

Estimation of Carbon Dioxide by Densimetry. AUGUSTUS D. WALLER and B. J. COLLINGWOOD (*Proc. physiol. Soc.*, 1903, xxxvi—xxxix; xxxix—xlii; *J. Physiol.*, 30).—With certain precautions, the method previously described by Waller for the estimation of ether and chloroform vapour in air (Abstr., 1903, ii, 699) may also be employed for the estimation of carbon dioxide. The method was controlled by estimations by absorption in potash.

By making such observations with inspired and expired air, it is possible to calculate the respiratory quotient; certain fallacies in the usual method of reckoning this number are pointed out. W. D. H.

Estimation of Potash in Soils, Ashes, &c. JULIUS HASENBÄUMER (*Chem. Zeit.*, 1904, 28, 210—211).—The hydrochloric acid solution of the soil is evaporated in a porcelain dish, redissolved in water, and transferred to a platinum basin. A little ammonia and ammonium carbonate are added, and after evaporating to dryness, the residue is heated over a rose burner until the ammoniacal salts have been expelled, and the organic matter destroyed. The residue is then treated for some time with hot water, and the potassium is estimated in the filtrate as usual with platinic chloride or perchloric acid.

Should the sample contain a decided amount of sulphuric acid, this must be first removed with barium chloride. L. DE K.

Estimation of the Amount of Sodium Carbonate necessary to Precipitate Lime and Magnesia in the Chemical Purification of Water. LÉO VIGNON (*Bull. Soc. chim.*, 1904, [iii], 31, 108—110. Compare Abstr., 1899, ii, 452).—When water is titrated with sodium carbonate by the process suggested by Vignon and Meunier (*loc. cit.*) at the ordinary temperature, the quantity (A) of sodium carbonate which must be added in order to produce a red coloration with phenolphthalein is less than the amount (*B*) required when the titration is effected by boiling the water in a nickel crucible for 30 minutes with excess of the sodium carbonate solution and then determining the unused sodium carbonate remaining. When the titration is carried out at temperatures intermediate to these and in varying periods of time, quantities intermediate in value between (*A*) and (*B*) are obtained. It is pointed out therefore that in determining the amount of sodium carbonate to be added to water as a purifying agent, the temperature at which the water is to be used and the time it will be in contact with the reagent should be taken into account. The quantity of sodium carbonate remaining in the purified water should not exceed 10 grams per cubic metre. T. A. H.

Rapid Estimation of Mercury by means of Hypophosphorous Acid. Bernard F. Howard (*J. Soc. Chem. Ind.*, 1904, **23**, 151—153).—From 1 to 3 grams of the mercury salt under examination are treated with from 10 to 30 c.c. of hypophosphorous acid of sp. gr. 1·136, and heated for about 20 minutes on the water-bath. The globule of mercury formed is washed with water, alcohol, and ether, all the washings being passed through a small filter which previously has been washed with hypophosphorous acid, alcohol, and ether, dried and weighed. The globule of mercury, after drying in a desiccator, is weighed, as is also the film of mercury collected on the filter. The method gives trustworthy results with most mercury salts, with the exception of mercuric iodide. In the case of mercuric nitrate, water must be added before reducing. W. P. S.

Separation of the Metals of the Ammonium Sulphide Group, especially in presence of Nickel and Cobalt. Hans Boetticher (*Zeit. anal. Chem.*, 1904, **43**, 99—104).—The following scheme is proposed as an improvement on the ordinary method for the qualitative detection of the metals in the precipitate produced by ammonium sulphide. The precipitate is dissolved in nitrohydrochloric acid and the solution evaporated. After redissolving in dilute hydrochloric acid, an excess of sodium hydroxide and some bromine are added. The filtrate is acidified in the cold (to avoid reducing chromic acid), mixed with excess of ammonium carbonate, and boiled to precipitate alumina. The filtrate is boiled with sodium hydroxide and examined for zinc and chromic acid. The precipitate containing cobalt, nickel, iron, and manganese is dissolved in hydrochloric acid, the excess of acid expelled, and much ammonia added with a little hydrogen peroxide. Cobalt and nickel pass into solution and are separated by potassium nitrite. Iron and manganese are then separated by the basic acetate method. If phosphates are present, it is merely necessary to test for iron before the separation from manganese, and then to add a sufficiency of ferric chloride before boiling with sodium acetate. After precipitating manganese as sulphide, the alkaline earths will be found in the filtrate. M. J. S.

Preparation of Pure Iron for Standardising Permanganate. Anton Skrabal (*Zeit. anal. Chem.*, 1904, **43**, 97—98).—Most commercial specimens of Mohr's salt contain other metals, notably zinc, from which, owing to their double salts crystallising isomorphously with that of iron, it cannot be purified by recrystallisation. By starting with a ferric salt, the metals of the zinc group can be eliminated. Iron-ammonium alum is therefore repeatedly crystallised from an acid solution, or, still better, the iron is precipitated several times by boiling a solution nearly neutralised with ammonium carbonate. The requisite quantity of ammonium sulphate is then added, and the ferric salt reduced to ferrous salt by electrolysing, employing a large platinum foil cathode and a wire anode. The ferrous ammonium sulphate is then twice recrystallised or fractionally precipitated by alcohol, thus freeing it from metals of the aluminium group. In this way, a stock of pure Mohr's salt can be secured, from which, by the author's process (Abstr., 1903, 22, 685), perfectly pure iron can at any time be obtained. M. J. S.

Distinctive Character of the Salts of Cobalt and Nickel. GABRIEL GUÉRIN (*J. Pharm. Chim.*, 1904, [vi], **19**, 139).—On adding excess of potassium hydroxide, followed by 2 per cent. solution of iodine in potassium iodide until a yellow coloration of the liquid is produced, cobalt salts give the black sesquioxide, whilst those of nickel give the green hydroxide. Similar results follow the treatment of the ferrocyanide, carbonate, and phosphate precipitates of these metals.

Potassium hydroxide alone gives black sesquioxide with the ferricyanides, instantly with that of nickel, and less rapidly with that of cobalt. G. D. L.

Colour Reactions of Molybdic Acid. M. EMMANUEL POZZI-ESCOT (*Compt. rend.*, 1904, **138**, 200. Compare Matignon, this vol., ii, 214).—A solution of tannin gives an orange coloration with a neutral solution of molybdic acid, which becomes cherry-red in concentrated and yellow in dilute solutions; the reaction is a very delicate one and capable of detecting 1 part of molybdic acid in 100,000 parts of a solution of the ammonium salt. The colour is destroyed by acids, but is not altered by boiling. Similar colour reactions are given by gallic acid and pyrogallol, extract of yellow-wood, and other tannifers. Extract of logwood gives a brown precipitate, but no characteristic colour. Some of these coloured molybdic compounds dye wool and leather brilliant shades. Small quantities of iron give no reaction with tannin in the presence of molybdenum. M. A. W.

Volumetric Estimation of Tungsten-steel and Ferrotungsten. E. KUKLIN (*Chem. Centr.*, 1904, **1**, 543—544; from *Stahl ü Eisen*, **24**, 27).—The process is based on the fact that metatungstic acid is reduced by zinc to the dioxide, which may then be titrated with permanganate.

Tungsten-steel is dissolved in a mixture of equal parts of sulphuric and phosphoric acid diluted with treble the volume of water; the solution is oxidised with permanganate and divided into two equal parts. One half is treated with excess of zinc, and the resulting liquid is titrated with permanganate. In the other half, the iron is estimated by means of stannous chloride and iodine, and from the result it is calculated how much permanganate this iron has reduced; the balance then represents permanganate due to oxidation of tungsten dioxide.

Ferrotungsten is fused with ammonium nitrate, the nitrates are decomposed by a strong heat, and the oxides are fused with potassium sodium carbonate. The fused mass is then treated with the above acid mixture. Ferrotungsten may also be attacked by fusion with sodium pyrosulphate. L. DE K.

Analysis of Commercial Tin; Rapid Estimation of Tungsten and Iron. LOUIS CAMPREDON and G. CAMPREDON (*Ann. Chim. anal.*, 1904, **9**, 41—45).—*Lead, iron, manganese, zinc.*—Ten grams of the sample are dissolved in a mixture of 10 c.c. of nitric and 80 c.c. of hydrochloric acid, the solution is neutralised with sodium hydroxide and heated with an excess of sodium polysulphide. The insoluble sulphides are collected, washed, and dissolved in hot nitric acid, 10 c.c. of sulphuric acid are added, and the nitric acid expelled by heating. The residue is treated with water and the undissolved lead sulphate is dissolved in ammonium acetate and finally precipitated and weighed as chromate.

The filtrate from the lead sulphate is first neutralised and, after adding 2 c.c. of hydrochloric acid, treated with hydrogen sulphide to remove any remnant of tin and copper. The filtrate is boiled, mixed with 2 c.c. of bromine, the iron and manganese are jointly precipitated with ammonia, and finally separated in the usual manner. The filtrate is then treated with sodium sulphide and any zinc is collected as sulphide.

Arsenic, antimony, copper.—Ten grams of the sample are dissolved in 90 c.c. of nitro-hydrochloric acid, boiled to expel the nitric acid, rendered slightly alkaline with sodium hydroxide, and mixed with 50 grams of oxalic acid. The liquid is then diluted to 750 c.c., heated in the boiling water-bath, and treated for two hours with hydrogen sulphide. The precipitate is washed and digested with 10 c.c. of aqueous sodium hydroxide, which dissolves the arsenic and antimony and leaves any copper sulphide, which is then converted into oxide by calcination and finally estimated volumetrically or colorimetrically. The alkaline solution is acidified with hydrochloric acid in large excess and the arsenic collected and weighed as trisulphide, or it may be redissolved and finally weighed as magnesium ammonium arsenate. The acid liquid still retains antimony, which may be reprecipitated in the presence of oxalic acid by a current of hydrogen sulphide, as directed previously.

Sulphur.—Ten grams of the sample are dissolved in 100 c.c. of hydrochloric acid, and the gas evolved is passed through a series of absorption tubes containing zinc acetate solution. The zinc sulphide is then collected and titrated by means of standard iodine as usual. *Phosphorus.*—1·25 grams of the sample are dissolved in 30 c.c. of nitro-hydrochloric acid, and after evaporation the residue is dissolved in 10 c.c. of dilute hydrochloric acid (1 : 1) and treated in a 250 c.c. flask with hydrogen sulphide. The liquid is diluted to the mark, 200 c.c. of the filtrate are boiled to expel the hydrogen sulphide, mixed with 10 c.c. of nitric acid, evaporated to 15 c.c., nearly neutralised with ammonia, and treated with excess of molybdate solution, and the yellow precipitate so obtained is finally weighed as such.

Tungsten, tin oxide.—Twenty-five grams of the metal are digested in the cold with a quantity of ferric chloride solution containing 50 grams of metallic iron and free from excess of acid. When the tin has dissolved, the insoluble matter is collected, washed with water slightly acidified with hydrochloric acid, and then ignited and weighed. It is then fused with 1 gram of sodium carbonate and 0·1 gram of nitre; the fused mass is dissolved in hydrochloric acid and evaporated to dryness, the residue is treated with 25 c.c. of dilute hydrochloric acid (1 : 1), and the undissolved matter dissolved in ammonia. The solution contains the tungsten which is recovered as tungstic acid by evaporating the solution and igniting the residue. The acid liquid contains the tin present in the sample as oxide and is treated with hydrogen sulphide as usual. A more correct estimation, however, of this tin is obtained by reducing the black deposit in a current of hydrogen at a red heat, and then dissolving the metal in hydrochloric acid.

Rapid estimation of tungsten and iron.—Ten grams of the sample are dissolved in 90 c.c. of nitro-hydrochloric acid, evaporated to a pasty consistency, redissolved in 40 c.c. of dilute hydrochloric acid (1 : 1), and diluted to 100 c.c. with boiling water. The insoluble matter, after being well washed with hot acidified water, is treated with ammonia, which dissolves the tungstic acid. On evaporating the solution and igniting the residue, pure tungsten trioxide is left.

Iron.—The acid liquid is rendered alkaline with sodium hydroxide, the iron precipitate is washed first with boiling water containing sodium hydroxide, then with plain boiling water. The precipitate is dissolved in hydrochloric acid, diluted to 200 c.c., and reduced by boiling with sodium hydrogen sulphite. After expelling the excess of sulphur dioxide, the heavy metals are precipitated with hydrogen sulphide, and after removing the excess of the latter by boiling, the iron is reoxidised with nitric acid, precipitated with ammonia, and finally weighed as oxide.

L. DE K.

Volumetric and Gravimetric Determination of Platinum. ERWIN RUPP (*Arch. Pharm.*, 1904, **242**, 143—156).—An approximately 4 per cent. potassium dichromate solution is made and standardised with *N*/20 thiosulphate solution. A 2·0—2·5 per cent. thallous nitrate solution is prepared and standardised against the dichromate as described in Abstr., 1903, ii, 183. Ten c.c. of the dichromate solution, about 1 gram of calcium carbonate, and 10 c.c. of the thallous nitrate solution are used, and of the filtrate 25 c.c. are mixed with 50 c.c. of water, 1—2 grams of potassium iodide, and 5 c.c. of 25 per cent. hydrochloric acid, and after 5 minutes are titrated with *N*/20 thiosulphate. For the estimation of platinum, the solution of platinic chloride is mixed with a considerable excess of the thallous nitrate solution in a 50 or 100 c.c. flask, allowed to remain in the cold for an hour with occasional gentle agitation, diluted to the mark, and filtered through a double filter from the precipitate of thallous platinichloride; the excess of thallous salt is determined in an aliquot part of the filtrate as described above; 1 c.c. of $N/20$ thiosulphate $=0\cdot0032465$ gram of platinum. The platinum solution must contain but little free hydrochloric acid; otherwise some of the thallous salt will be precipitated as chloride. In five experiments, each with 0·046 gram of platinum, the error varied between $-0\cdot25$ and $+0\cdot5$ per cent. of the total amount.

For the gravimetric estimation, hydrazine hydrochloride is the most satisfactory reducing agent. The solution is diluted to about 100 c.c. in a conical flask; if any mineral acid is present, excess of sodium acetate is added; about 3 grams of hydrazine hydrochloride are added, and the whole is then heated on the water-bath until (after about two hours) the solution is quite clear. The precipitate is then collected on a double filter; this is dried and burned in a coil of platinum wire, and the residue is ignited in a crucible. In five experiments, each with 0·2 gram of platinum, the error varied between $-0\cdot3$ and $-0\cdot05$ per cent. of the whole.

In solutions of platinichloric acid (platinic chloride), the platinum can be estimated by evaporating to dryness in a glazed Rose crucible, heating the residue with a small flame, so that a gentle evolution of gas begins, continuing this heating in a fairly rapid current of hydrogen until (after about five minutes) no further smell of hydrogen chloride is noticeable, igniting, continuing the ignition after stopping the current of gas, and weighing. In four experiments, each with 0·2 gram of platinum, the error varied between 0·0 and $+0\cdot4$ per cent. of the whole.

Ignited platinum in a more or less finely divided state should be weighed as soon as it is cold; in 24 hours, a gain in weight of 1 per cent. or more may occur. This is probably due to oxidation (Wöhler, this vol., ii, 44).

Peterson's iodometric method for the estimation of platinum (Abstr., 1899, ii, 253) is quite untrustworthy, even when modified as by Gooch and Morley in the case of gold (Abstr., 1900, ii, 110). C. F. B.

Hydroxylamine Salts in Qualitative Analysis. Nazareno Tarugi (*Gazzetta*, 1903, **33**, ii, 449—454).—Dilute aqueous solutions of platinic chloride are not reduced on adding a 20 per cent. solution of hydroxylamine hydrochloride mixed with an equal volume of ammonia; in more concentrated solutions, when the hydroxylamine is in excess, on warming, the compound $Pt(NH_2\cdot OH)_4(OH)_2$ (Uhlenhuth, Abstr., 1900, ii, 485) is precipitated as a white, silky mass, insoluble in water; and when the platinic chloride is in excess, instead of this compound, Magnus's salt is produced, showing that reduction to platinous chloride must have taken place initially. These facts make impracticable the application of hydroxylamine to the separation of mercury, platinum, and gold in qualitative analysis, as suggested by Knoevenagel and Ebler (Abstr., 1902, ii, 697). Assuming that Uhlenhuth's base is, on reduction, precipitated with metallic gold and mercury, on dissolving in nitric acid the platinum goes into solution with the mercury, and the same objections apply as were brought forward in the case of hydrazine salts (this vol., ii, 131). If Magnus's salt is formed, its insolubility in nitric acid and in aqua regia still more complicates the separation.

W. A. D.

Estimation of Thiocyanates in the presence of Chlorides, &c. A. Dubosc (*Ann. Chim. anal.*, 1904, 9, 45—46).—The estimation of thiocyanates by means of silver nitrate is not applicable in the presence of chlorides or other compounds which precipitate silver solutions. The conversion of the sulphur into sulphate by means of potassium permanganate in acid solution gives indifferent results.

The sulphur contained in the thiocyanate may, however, be quantitatively converted into sulphate by mixing the solution with 2 grams of barium chloride, dissolved in 50 c.c. of water, and then adding 50 c.c. of an oxidising solution obtained by electrolysing brine and cooling the anode. This liquid contains some 20 grams of available chlorine per litre. After 10 minutes, 10 c.c. of hydrochloric acid are added, and the liquid is boiled. The barium sulphate so obtained is collected as usual.

Sulphates should be allowed for. Sulphides should be first removed by means of a suitable metallic salt. L. de K.

Jacquemin's Phenol Reaction; Detection of Oil of Cloves in Oil of Cinnamon. J. F. A. Pool (*Chem. Centr.*, 1904, i, 404; from *Pharm. Weekbl.*, 40, 1101—1103).—Jacquemin's reagent gives a blue coloration with those aromatic compounds which contain hydroxyl groups, and is, therefore, a valuable test for the detection of oil of cloves in oil of cinnamon, which does not contain such compounds. One c.c. of a dilute solution of aniline is mixed with a solution of sodium hypochlorite until the liquid assumes a violet colour, and a drop of the suspected oil is then added. If the oil of cinnamon is pure, a dirty violet liquid is obtained on shaking, which, after being diluted with water, yields a clear, violet filtrate, but if oil of cloves is present a green filtrate is obtained. L. de K.

Estimation of Starch by Hydrolysis with Hydrochloric Acid. Adelbert Rössing (*Zeit. öffentl. Chem.*, 1904, 10, 61—64).—Two methods were tried. In the first (Sachsse's method), 3 grams of starch were boiled with 200 c.c. of water and 15 c.c. of hydrochloric acid of sp. gr. 1·125 for 2½ hours in a reflux apparatus. After cooling, the solution was neutralised and diluted to 500 c.c. The dextrose was then estimated in 25 c.c. by Allihn's method. According to the second method, 2 grams of starch were boiled with 100 c.c. of water and 15 c.c. of hydrochloric acid of sp. gr. 1·19 for 2 hours in a reflux apparatus. The cold solution was then neutralised, diluted to 250 c.c., and filtered, if necessary. The dextrose was estimated as in the first method. Using the factor 0·9 to convert the dextrose into starch, too low results were obtained, but by employing the factor 0·94 for the first method, and 0·93 in the second, the quantity of starch found agreed with that actually present. The starches examined were wheat, potato, rice, maize, and arrowroot. Although trustworthy results were obtained with pure starches, the hydrolysis method is unsuitable for estimating starch and dextrin in baked materials. W. P. S.

Detection of Salicylic Acid in Wines by a New Reaction. Behaviour of Wines in the Etna District with this Test. II. Matteo Spica (*Gazzetta*, 1903, 33, ii, 482—487. Compare Abstr., 1895, ii, 426).—Wines from the Etna district, which were known not to contain salicylic acid, responded to the test for this substance which has been already described (*loc. cit.*). It is shown that these wines contain a colouring matter which is responsible for the result. The test is, however, a perfectly trustworthy one if carbon disulphide is used instead of ethyl acetate in extracting the salicylic acid; in this solvent, the enolic acid which produces the confusion is insoluble. Or the dye produced upon the wool fibre may be dissolved off by an alkaline solution, and an attempt made to redeposit it upon a new fibre by the addition of acid; only when the yellow colour is transferable in this way to a second fibre can the presence of salicylic acid be inferred.

W. A. D.

Distinction between Boiled and Unboiled Milk. E. I. Van Itallie (*Chem. Centr.*, 1904, i, 403; from *Pharm. Weekbl.*, 40, 1103—1104).—Boiled milk may be readily distinguished from unboiled milk by means of *p*-phenylenediamine and hydrogen peroxide, which give a blue colour with the unboiled samples. As the ferment which causes the coloration is not destroyed below 80°, pasteurised milk also gives a blue colour reaction. L. de K.

Method of Estimating Formaldehyde prescribed by the German Pharmacopœia. Carl Kippenberger (*Zeit. anal. Chem.*, 1903, 42, 686—696).—The method depends on the conversion of the formaldehyde into hexamethylenetetramine by treatment with a known excess of ammonia solution, and the estimation of the unconsumed ammonia by adding *N*-hydrochloric acid and titrating back with *N*-potassium hydroxide, using rosolic acid as indicator. The method is liable to several sources of error. The ammonia must be absolutely free from carbonate, otherwise it can only be accurately titrated with methyl-orange. A small but uncertain amount of the standard acid employed is consumed by combination with the hexamethylenetetramine, and at the same time part of the amine is decomposed both by the action of the acid and to a smaller extent by that of the alkali. A much more satisfactory method of estimation is found in the conversion of the formaldehyde into thioformaldehyde by the action of hydrogen sulphide. The formaldehyde solution is diluted to 10 volumes with water, then twice the volume of concentrated hydrochloric acid and some alcohol are added, and the hydrogen sulphide is passed through the liquid in a flask, connected with a second flask, to arrest any formaldehyde which may be expelled. After 24 hours, the precipitate is collected, freed from sulphur by washing with potassium sulphide, and then with water and alcohol, and finally dried and weighed. Concordant results are obtained, which do not agree with those yielded by the official method.

M. J. S.

Reaction of Aromatic and Fatty Aldehydes. Samuel S. Sadtler (*Amer. J. Pharm.*, 1904, **76**, 84—87).—The following method is recommended for the estimation of citral in oil of lemon. A quantity of the oil, weighing 5 or 10 grams, is placed in a flask and neutralised with $N/2$ potassium hydroxide, rosolic acid being used as an indicator. Twenty-five or 50 c.c. of hot sodium sulphite solution (20 per cent.) are neutralised with $N/2$ hydrochloric acid, and afterwards added to the flask containing the oil. A red coloration is immediately produced and is discharged by the addition of $N/2$ hydrochloric acid. The flask is then heated and frequently shaken. Hydrochloric acid is added until the liquid no longer assumes a red colour, the quantity of acid used is noted, and the amount of citral is calculated, two mols. of hydrogen chloride being required for each mol. of citral.

The reaction is also applicable to the estimation of vanillin and fatty aldehydes. It may be employed for the detection and estimation of formaldehyde in milk, of acetone in wood spirit, and of acetaldehyde in grain spirit, and is especially suitable for the estimation of aldehydes in essential oils, such as those of cinnamon, cassia, bitter almonds, and lemon-grass. E. G.

Distinction between Chloral and Butylchloral. Emilio Gabutti (*Chem. Centr.*, 1904, i, 480—481; from *Boll. Chim. Farm.*, **42**, 777—778).—An admixture of chloral with the more expensive butylchloral may be detected as follows: a solution of pyrogallol in pure 60 per cent. sulphuric acid, when gently heated with pure chloral, gives a blue solution, but with butylchloral the colour turns wine-red; in the case of a mixture, a more or less violet colour will appear. The blue colour caused by chloral changes, on addition of water, to a yellowish-brown, whilst the wine-red colour of butylchloral turns more or less violet. On addition of alkalis or ammonia, a clear yellow colour makes its appearance (also compare Abstr., 1901, ii, 11, 362).

L. de K.

Detection of Acetone in Urine. Alexandre C. Vournasos (*Bull. Soc. chim.*, 1904, [iii], **31**, 137—139).—The author states that acetone may readily be detected in urine by the method already recommended by him for the detection of lactic acid in gastric juice (Abstr., 1902, ii, 364). In place of a solution containing iodine and methylamine, a solution of iodine (5 parts) in aniline (50 parts) may be employed. It is pointed out that alcohol, chloroform, and various acids, all of which may occur in urine, also give this reaction. Acetone may, however, be detected in presence of the acids by rendering the urine alkaline and distilling. T. A. H.

Nascent Sodium Hypobromite does not liberate all the Nitrogen of Urea. Léon Garnier (*J. Pharm. Chim.*, 1904, [vi], **19**, 137—139. Compare Abstr., 1900, ii, 699).—Although the disengagement of nitrogen is complete when 2 c.c. of 1 per cent. urea solution are treated by the method of Le Comte (Abstr., 1903, ii, 518), the method fails to give complete evolution with solutions of 2 per cent. strength. Admixture of dextrose raises the amount of nitrogen evolved. G. D. L.

Two New Reactions of Acetanilide. Etienne Barral (*J. Pharm. Chim.*, 1904, [vi], **19**, 237).—Phosphomolybdic acid gives, with a solution of acetanilide, a bright yellow precipitate, soluble on warming, which distinguishes it from the yellow precipitate given by phenacetin, which is insoluble on warming.

Mandelin's reagent with acetanilide gives a red colour rapidly changing to greenish-brown, whilst with phenacetin the coloration is olive-green in the cold, becoming reddish-brown on warming.

G. D. L.

Isolation of the Alkaloids in Chemico-legal Cases. Carl Kippenberger and L. von Jakubowski (*Zeit. anal. Chem.*, 1903, **42**, 696—707).—A comparison of Kippenberger's glycerotannic method (Abstr., 1895, ii, 465; 1901, ii, 79) with those of Stas-Otto, Hilger-Küster, and Dragendorff, when applied to the human stomach, intestines, spleen, and liver, free from vegetable alkaloids, gave the general result that the last three methods all yielded final solutions containing impurities which gave alkaloid reactions with iodine solution, phosphomolybdic acid, picric acid, and mercuric chloride, whilst the final solution obtained by the first-named method was markedly freer from impurities, and gave no precipitates with the above reagents.

M. J. S.

Amount of Caffeine in the Coffee used as a Beverage. Julius Katz (*Arch. Pharm.*, 1904, **242**, 42—48).—A satisfactory method for the estimation of caffeine has been devised (*Ber. deut. pharm. Ges.*, 1902, **12**, 250). As applied to the analysis of roasted and ground coffee it is as follows: of the powder, 10·0 grams are shaken mechanically with 200·0 c.c. of chloroform and 10·0 c.c. of "ammonia" for half an hour. After the solid has settled, 150·0 c.c. of the chloroform is filtered off through a Sanders "cigarette-filter," the chloroform distilled off, the residue mixed with 10 c.c. of 0·5 per cent. hydrochloric acid, and a few c.c. of ether, the ether boiled off on the water-bath after the addition of about 0·5 gram of solid paraffin, and the residue heated till the paraffin has melted completely. After the liquid has cooled, it is filtered through a wet filter, and the residue warmed twice in succession with 10 c.c. of 0·5 per cent. hydrochloric acid and filtered; the united filtrate is extracted with chloroform for 2 hours in a Katz percolator, the chloroform evaporated, and the residue of crude caffeine weighed. The crude caffeine is then dissolved in 10 c.c. of water (with the addition of a few drops of ether, which are then boiled off); the hot solution is heated for 10 minutes with 3 c.c. of a suspension of lead hydroxide in water (1 : 20), mixed with about 0·2 of calcined magnesia, and filtered, the residue being washed with water; the filtrate is extracted with chloroform for 2 hours in the percolator, the chloroform evaporated, and the residue of pure caffeine weighed.

The sample of coffee examined contained 1·34 per cent. of crude, 1·26 of pure caffeine. In the preparation of the beverage, 300 c.c. of boiling water were used with 15·0 grams of the ground coffee. When a special coffee apparatus (Arndt's) was used, the liquid contained 96·5 per cent. of the caffeine in the powder used. When the boiling water was poured over the ground coffee and the mixture boiled for 5 minutes, according to the prescription of the German pharmacopœia, 85 per cent. was present. When the boiling water was simply poured over the coffee resting on filter-paper in an ordinary coffee funnel or sieve, only 60 per cent. of the total caffeine was obtained in the liquid. Prepared by either of the first two methods, a cup of coffee holding 150 c.c. contains about 0·1 gram of caffeine. The amount of total solid matter extracted runs roughly parallel to the amount of caffeine, varying from 0·8 to 1·5 per cent. of the liquid according to the method employed.

The result was much the same whether distilled water was used or the Leipzig town supply with 8·75 degrees of permanent and 4·0 of total hardness (parts $CaCO_3$ per 100,000 of water). The addition of 0·1 per cent. of sodium hydrogen carbonate to the latter had but little effect. C. F. B.

Colour Reactions of Pilocarpine. Etienne Barral (*J. Pharm. Chim.*, 1904, [vi], 19, 188—189).—When boiled with sodium persulphate, a dilute solution of pilocarpine gives fœtid, faintly ammoniacal vapours, which blue turmeric and blacken mercurous nitrate. Several drops of the pilocarpine solution warmed with sulphuric acid and formaldehyde give a yellow colour, changing to brownish-yellow, blood-red, and finally brownish-red.

Mandelin's reagent gives, on warming, a golden-yellow, changing to a clear green, and finally to a blue colour, which is unaltered by dilution.

A 1 per cent. solution of potassium permanganate in concentrated sulphuric acid on warming is at first decolorised, then becomes yellow, and gives vapours smelling like burnt tartaric acid. G. D. L.

A Ptomaine Resembling Veratrine. Stüber (*Zeit. Nahr. Genussm.*, 1903, 6, 1137—1138).—During an investigation as to the cause of the death of over 100 rats, the bodies of which were found in the hold of a ship, it was found that, whilst no metallic poisons or plague bacteria were present, a substance could be obtained from the bodies, by the usual methods for separating the alkaloids, which closely resembled veratrine in some of its chemical reactions. The purified substance consisted of a yellow, amorphous mass. When a trace of the latter was warmed with concentrated sulphuric acid, a brilliant cherry-red solution was obtained, exactly similar to that given by pure veratrine. The ptomaine gave precipitates with iodine and tannin solutions, but did not react with platinic or mercuric chlorides. It differed from veratrine in producing no muscular contractions when injected into a frog. W. P. S.

Estimation of Quinotannates in de Vrij's Cinchona Extract. JULES WARIN (*J. Pharm. Chim.*, 1904, [vi], 19, 233—236).—The precipitation and weighing of alkaloid quinotannates from this extract by the addition of sodium acetate does not give correct quantitative results, since about one-fifth of the alkaloids remain unprecipitated, whilst a further smaller proportion is taken up by the washing water.

For comparative purposes it is therefore necessary to operate under similar conditions, and it is preferable to determine quinotannate after extraction of the alkaloids from ammoniacal solution. G. D. L.

Estimation of Indoxyl by Nitration of the Indigo Dyes. LOUIS MAILLARD (*Compt. rend. Soc. Biol.*, 1903, 55, 1506—1508).—Whilst admitting that Monfet's method, which consists in nitration of the indigo dyes (indigotin, indirubin), and then estimating colorimetrically the picric acid formed, can, if carried out properly, be considered exact, the author still holds that the method of sulphonation has the advantage. W. D. H.

Estimation of Indican in Urine. ALEXANDER ELLINGER (*Zeit. physiol. Chem.*, 1904, 41, 20—32).—Polemical against Bouma and Maillard. W. D. H.

Sensitive Test for Bile Pigments in Urine. ADOLF JOLLES (*Zeit. anal. Chem.*, 1903, 42, 713—716).—About 10 c.c. of the urine are shaken up with 1 c.c. of chloroform and 4—5 c.c. of a 10 per cent. barium chloride solution and left in repose for a minute. The supernatant liquid is removed and the residue treated with 2—3 c.c. of an *N*/100 Hübl iodine solution and 1 c.c. of concentrated hydrochloric acid, shaken, and allowed to settle. If bile pigments are present, the precipitate, the chloroform, and the aqueous layer are all coloured green to greenish-blue. About 0·1 mg. of bilirubin in 100 c.c. of urine is the lower limit of the reaction. With highly concentrated urines, especially those rich in indican, a more complete removal of the urine from the chloroform is necessary. It is recommended to use 2—3 c.c. of chloroform and 1 c.c. of barium chloride and to use a centrifuge, washing subsequently 2 or 3 times with water. The precipitate is then shaken with 5 c.c. of alcohol and 2—3 drops of the following iodine solution: 0·63 gram of iodine and 0·75 gram of mercuric chloride are each dissolved in 125 c.c. of alcohol; the solutions are mixed, and 250 c.c. of concentrated hydrochloric acid are added. This solution can be preserved for a long time in brown glass bottles. M. J. S.

Estimation of Bilirubin in Serum. A. GILBERT, M. HERSCHER, and SWIGEL POSTERNAK (*Compt. rend. Soc. Biol.*, 1903, 55, 1587—1590).—The method devised is a colorimetric one, namely, the intensity of the Gmelin reaction. It is, however, based on the assumption that the normal pigment of blood serum is bilirubin. W. D. H.

Estimation of Albumin in Serums. EMIL REISS (*Chem. Centr.*, 1904, i, 481—482; from *Arch. exp. Pathol. Pharm.*, 51, 18—29).—The index of refraction of the serum is taken, and after allowing 0·00277 for non-albuminous matters and 1·3320 for the refraction of pure water, the remainder is divided by 0·00172; the result represents the percentage of albumin. L. de K.

Estimation of an Organic Phosphorus Compound in Grape Stones and Wines. T. Weirich and G. Ortlieb (*Chem. Zeit.*, 1904, 28, 153—154).—Wine contains a lecithin which may be extracted from the residue by means of absolute alcohol. Phosphorus is then estimated in the usual way, and from this the amount of real lecithin in the extract is calculated. This lecithin is, however, rapidly decomposed at an elevated temperature. In conducting the experiments, the sample should be evaporated in vacuum, or at all events at a temperature not exceeding 50°. It is also sensibly soluble in ether or chloroform. L. de K.

Macroscopic Detection of Leucocytosis. Carl Hirsch and Ed. Stadler (*Zeit. physiol. Chem.*, 1904, 41, 125—127).—The well-known method of detecting pus in urine by the gelatinous mass produced by adding strong alkali is due to the formation of sodium nucleate. The same reaction may be successfully employed as a naked eye test for excess of leucocytes in blood. W. D. H.

The Reactions for the Oxidising Enzymes of Cow's and Human Milk. W. Rullmann (*Zeit. Nahr. Genussm.*, 1904, 7, 81—89).—By heating cow's milk for 1 hour at a temperature of 68—69°, practically all bacteria were destroyed, but the enzymes were not affected unless the temperature exceeds 70°. A number of experiments are given, in which the usual tests for detecting oxydase were employed, the results showing that the enzyme is present in milk sterilised at a temperature not exceeding 70°. The *p*-phenylenediamine hydrochloride test was found to be the most sensitive for this purpose.

Oxydase was detected in human milk by the above-mentioned test 40 days after parturition. The guaiacum test gave negative results after the 28th day. W. P. S.

General and Physical Chemistry.

Satellite Rays in the Cadmium Spectrum. CHARLES FABRY (*Compt. rend.*, 1904, 138, 854—856).—When the ray 508·6 of the cadmium spectrum is examined by means of the interference spectroscope (compare Fabry and Perot, *Ann. Chim. Phys.*, 1899, [vii], 16), it is found to consist of two rays of unequal intensity, or of three rays of equal intensity, according as the metallic vapour is illuminated in a tube with aluminium electrodes or without electrodes (compare Hamy, *Compt. rend.*, 1900, 130, 700). In the latter case, as observed by Hamy, the presence of a small quantity of air in the tube causes two of the rays to become very feeble, whilst in the former case the substitution of electrodes of fused cadmium for those of aluminium causes the ray 508·6 to present the triple appearance it exhibits in the tube without electrodes. It appears, therefore, that absolute purity of the luminous gas is a necessary condition for the satisfactory appearance of satellite rays, a condition which Bouty also found to obtain in the case of argon (compare this vol., ii, 309). M. A. W.

Ultra-violet Spectra of a Tautomeric Compound. R. MAGINI (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 104—108. Compare Abstr., 1903, ii, 706, and this vol., ii, 107).—The author has examined the ultra-violet absorption spectra of two samples of ethyl acetoacetate, one of which was stated by Schiff to be the pure enolic modification, and the other to consist of about equal proportions of the enolic and keto-forms. The differences between the two spectra are very slight, as also are those produced by distilling the liquids, and do not admit of any conclusion being drawn as to the existence of keto- and enolic modifications of ethyl acetoacetate. T. H. P.

Action of Chemical and Osmotic Phenomena on Phosphorescence. M. LAMBERT (*Compt. rend.*, 1904, 138, 626—627).—The production of *N*-rays by the opening of a previously closed Leclanché cell (compare Jégou, *Compt. rend.*, 1904, 138, 491) is to be attributed to the chemical action taking place in the cell when the circuit is closed, which, owing to polarisation, persists when the circuit is open. In the case of a dichromate cell, in which the chemical action proceeds in open circuit and the phenomenon of polarisation is very marked, the production of *n*-rays, as detected by the increased brightness of a phosphorescent screen, is apparent even without closing the circuit.

The osmotic phenomenon occurring in voltaic elements containing two liquids separated by a porous septum forms another probable source of *n*-rays, for the author finds that a phosphorescent screen becomes brighter when it is placed near a vessel containing a 0·7 per cent. solution of sodium chloride separated by parchment from a more concentrated solution of the same salt. M. A. W.

Emanation given off by Radium. J. A. McClelland (*Phil. Mag.*, 1904, [vi], 7, 355—362).—The object of the experiments was to test as accurately as possible whether the emanation from radium carries with it an electric charge, and a description of the apparatus and method of working is given. The results indicate that the emanation is not charged. The radium atom gives off positively charged particles—the α-rays. The emanation cannot be what remains of the atom after the emission of these rays, as it would then be negatively charged; the atom must have therefore parted with an equal negative charge either by the emission of negative particles, or in some other way. L. M. J.

Radioactivity of Certain Minerals and Mineral Waters. Robert J. Strutt (*Proc. Roy. Soc.*, 1904, 73, 191—197).—A number of minerals are known to be radioactive, and the experiments were made with the object of ascertaining whether any unknown radioactive matter is indicated in these minerals. The method adopted was to heat the crude mineral and examine the rate of decay of the emanation given off. Although small quantities of an emanation less durable than that of radium might escape detection, any emanation more durable would have been recognised. The minerals examined were samarskite from N. Carolina, fergusonite from Norway (?), pitchblende from Cornwall, malacone from Norway, monazite from Norway, N. Carolina, and Brazil, and zircon from N. Carolina. No new emanation was recognised, the results in all cases indicated radium. Malacone contains argon as well as helium, but no new radioactive element was indicated. The only mineral yielding thorium emanation was monazite from Norway. A small quantity of red deposit from the water of the King's Spring at Bath was examined. It was found to be active, the activity being due to radium, and the same result was found for other Bath spring deposits, whilst radium was also found in the water. The author calculates the annual delivery of radium by the spring to be about one-third gram, and of helium about 1000 litres. This ratio is of the same order as in the radioactive minerals. L. M. J.

Law of Disappearance of Induced Radioactivity after Heating the Active Substance. Pierre Curie and J. Danne (*Compt. rend.*, 1904, 138, 748—751. Compare Abstr., 1903, ii, 50, 255).—The effect of heating a substance which has been rendered radioactive by induction is to distil the radioactivity on to neighbouring substances (compare Gates, *Phys. Review*, May, 1903). An examination of the disappearance of induced radioactivity from plates which have been heated at various temperatures shows that the rate of decrease of activity tends towards the simple exponential expression $I=I_0e^{-c't}$, c' varying with the temperature of heating, first increasing with the temperature up to 1100°, then diminishing.

In another series of experiments, the induced radioactivity of a platinum wire was distilled on to a surrounding platinum cylinder, which was then examined in respect of the rate of disappearance of the activity, with the result that the activity first increases, reaches a maximum, and then falls off. If, however, the distillation is effected in two fractions, the rate of decrease of the induced radioactivity due to the second distillation at the higher temperature can be expressed by a simple exponential expression.

These facts can be explained on the hypothesis that below 600° the substance *B* only distils, leaving the original plate radioactive with *C*, the rate of decrease of which is given by a simple exponential expression; at higher temperatures, 700°, *C* also distils, whilst at still higher temperatures the nature of *C* is modified. In the case of the plates on to which the induced radioactivity has been distilled, below 600° *B* only is condensed and slowly changes into *C*, at higher temperatures both *B* and *C* condense. M. A. W.

Action of Canal Rays on Aluminium and Zinc Oxides. GERHARD C. SCHMIDT (*Ann. Physik*, 1904, [iv], 13, 622—633. Compare Abstr., 1903, ii, 50).—In a previous paper (*loc. cit.*), the author adopted the view that zinc oxide generally fluoresces under the action of canal rays, because it contains an admixture of foreign oxide in solid solution. This view was adversely criticised by Tafel (*Ann. Physik*, 1903, [iv], 11, 613), who regarded the fluorescence as the sequel of a transformation into another modification. In the present paper, the author records further experiments, showing that aluminium and zinc oxides do not fluoresce when absolutely pure, but only when they contain an admixture of other oxide (for example, of chromium and cadmium respectively) in solid solution. J. C. P.

The Possibility of Showing by a Contrast Phenomenon the Objective Action of *n*-rays on Luminous Calcium Sulphide. J. MACÉ DE LÉPINAY (*Compt. rend.*, 1904, 138, 798—799).—Taking advantage of the fact discovered by Blondlot (*Compt. rend.*, 1904, 138, 547) that the action of the *n*-rays on luminous calcium sulphide is reversed when the surface of the latter is viewed in a very oblique direction, the author describes a device by means of which the objective effect of *n*-rays can be appreciated by observers who are unable to discern the ordinary action of the rays. The arrangement consists of two luminous calcium sulphide screens, one large one (20 cm. × 2 cm.), placed in a horizontal plane with its long axis parallel to the direction of vision, and one small one (2 cm. × 0·2 cm.), placed in a vertical plane normal to the direction of vision and so inclined that, when the large screen is viewed in such an oblique direction that it looks like a narrow line, the appearance of the combination is that of the figure 7, the oblique branch of which is seen under normal, and the other under oblique incidence. When *n*-rays act simultaneously on the two luminous surfaces, the oblique branch of the 7 becomes brighter, whilst the other either becomes darker, or disappears altogether. M. A. W.

Standard Electrodes. LUDWIG SAUER (*Zeit. physikal. Chem.*, 1904, 47, 146—184).—The author has made a detailed study of the following electrodes: (*a*) $Hg \mid HgCl,1{\cdot}0NKCl$;

(*b*) $Hg \mid HgCl,0{\cdot}1NKCl$; (*c*) $Hg \mid HgCl,1{\cdot}0NHCl$;
(*d*) $Hg \mid HgCl,0{\cdot}1NHCl$; (*e*) $Hg \mid Hg_2SO_4,1{\cdot}0NH_2SO_4$;
(*f*) $Hg \mid Hg_2SO_4,0{\cdot}1NH_2SO_4$,

With due care in their preparation, it is possible to reproduce the *E.M.F.* of these electrodes within the following limits: (*a*), (*c*), (*e*), and (*f*) 0·1 millivolt; (*b*) 0·2 millivolt; (*d*) about 2 millivolts. The method adopted in preparing the electrode is to make a paste of the mercury and the depolariser by shaking them for a short time. In this way, a constant *E.M.F.* is obtained from the beginning. Assuming that the *E.M.F.* of (*a*) at 18° is 0·560 volt, the values obtained for the others at 18° are as follows: (*b*) +0·612 volt; (*c*) +0·554 volt; (*d*) +0·611 volt; (*e*) +0·962 volt. Incidentally, it was found that calomel is more soluble when finely divided than in the form of larger crystals (compare Ostwald, Abstr., 1900, ii, 712).

J. C. P.

Polarisation of Platinum, Gold, and Palladium Electrodes. E. Rothé (*Ann. Chim. Phys.*, 1904, [viii], 1, 289—237).—The *E.M.F.* of polarisation of platinum electrodes in acidified water varies continuously as the external *E.M.F.* increases. The curve obtained by plotting the *E.M.F.* as abscissæ and the deviations as ordinates shows an angular point in the neighbourhood of 1·55 volts, at which value the decomposition of the water begins.

The polarisation is to be attributed to the modification of the electrodes by their absorption of the ions with the formation of definite chemical compounds, hydrides, or oxides. In the case of two electrodes of unequal sizes, the smaller becomes modified before the larger, and therefore visible electrolysis may occur temporarily at that electrode when the external *E.M.F.* is much lower (1 volt) than the minimum value.

Similar results were obtained with gold and palladium electrodes.

M. A. W.

Dielectric Constants of some Inorganic Solvents. Herman Schlundt (*J. Physical Chem.*, 1904, 8, 122—130).—An extension of the author's previous work (Abstr., 1902, ii, 2). The results obtained are as follows:

Substance.	*D. C.*	*T.*	Substance.	*D. C.*	*T.*
Phosphorus trichloride ...	3·72	18°	Antimony tribromide ...	20·9	100°
Phosphorus tribromide .	3·88	20	,, ,, (solid)	5·05	20
Phosphorus tri-iodide	4·12	65	Antimony tri-iodide ...	13·9	175
,, ,, (solid)	3·66	20	,, ,, (solid)	9·1	20
Arsenic trichloride	12·6	17	Phosphorus	3·85	45
,, ,, (solid)	3·6	−50	,, (liquid)	3·85	20
Arsenic tribromide	8·83	35	,, (solid)	4·1	20
,, ,, (solid)	3·33	20	Silicon tetrachloride ...	2·40	16
Arsenic tri-iodide	7·0	150	Nitrogen peroxide	2·56	15
,, ,, (solid)	5·38	18	,, ,, (solid)	2·6	−40

In most cases, the dielectric constant is considerably less in the solid than in the liquid state, the change occurring during solidification. Of the substances observed, phosphorus trichloride, phosphorus tribromide, and silicon tetrachloride do not possess ionising power; they have low dielectic constants, and hence follow the Nernst-Thompson rule. Antimony trichloride has good, and arsenic trichloride fair, ionising power, this again being in accord with the rule (compare

Walden, Abstr., 1901, ii, 11). Nitrogen tetroxide was found by Frankland to have no ionising power (Trans., 1901, 79, 1356), its constant is also low. L. M. J.

Dielectric Cohesion of Argon and its Mixtures. E. Bouty (*Compt. rend.*, 1904, 138, 616—618).—The dielectric cohesion of argon is 6·8 times more feeble than that of hydrogen and 14 times more feeble than that of air, and for a constant volume the value is independent of the temperature. The addition of traces of foreign gases causes such a marked increase in the dielectric cohesion of argon that it forms almost as sensitive a test of the purity of the gas as that afforded by the spectrum. M. A. W.

Theory of Amphoteric Electrolytes. James Walker (*Proc. Roy. Soc.*, 1904, 73, 155—165).—Many substances are capable of behaving either as acids or as bases, and these have been termed amphoteric electrolytes. Although the dissociation constants, both with respect to their ionisation as acids and bases, have been determined for many such compounds by Winkelblech (Abstr., 1901, ii, 370), yet the theory has not been completely worked out and is now developed by the author on the basis of the mass-action law, and the electrolytic dissociation theory of Arrhenius. The various equations are deduced by means of which the concentration of the various ions may be determined if the concentration of the unionised compound, and the dissociation constants for the substance as acid and as base are known. It is pointed out that the conductivity is in such cases no measure of the ionisation. The effect of even feebly marked basic character is well exemplified by the comparison of the concentration of the positive ions in a simple acid, where $k_a = 10^{-5}$, and in amphoteric electrolytes with similar acid dissociation, but a basic dissociation of from $1·2 \times 10^{-14}$ to $1·2 \times 10^{-11}$. Ostwald obtained for *o*-aminobenzoic acid values for the dissociation constant which steadily increased with dilution and suggested that this was due to the existence of double molecules (Abstr., 1889, 818). The assumption is, however, unnecessary as the facts are in accord with the author's theoretical conclusions. It is further shown that the values obtained by Ostwald and Winkelblech for the three aminobenzoic acids are in good quantitative agreement with the values calculated on the basis of the theoretical deductions.
L. M. J.

Electrical Reduction. Fritz Haber and Rudolph Russ (*Zeit. physikal. Chem.*, 1904, 47, 257—335. Compare Haber, Abstr., 1900, i, 281, 282, 592; ii, 257; Russ, Abstr., 1903, ii, 631).—The electrical reduction of nitrobenzene and *p*-nitrophenol in alkaline solution is governed by the expression $E = xRT/2.\log I/C - A$, where E is the fall of potential at the cathode, I the current strength, and C the concentration of the depolariser, A is a constant, and x, whilst theoretically equal to unity, is found to be greater. The geometrical interpretation of the value of x previously advanced by Haber is not confirmed, and x apparently varies with the nature of the electrode.

The authors have studied the equilibria involved in the following reactions: (1) quinone + hydrogen iodide = iodine + quinol; (2) quinone + hydrogen = quinol; (3) iodine + hydrogen = hydrogen iodide. They find that reactions (1) and (2) proceed with a measurable velocity towards equilibrium, whilst (3) takes place with great rapidity. The quinone-quinol electrode was polarised, and its behaviour found to be in accordance with Haber's views. The phenomena observed, however, when the iodine (hydrogen iodide) electrode is polarised are quite different, and are to be referred not to velocity of reaction, but to velocity of diffusion. J. C. P.

Influence of the Cathode Material on the Electrolytic Reduction of Nitrobenzene. WALTHER LÖB and ROY W. MOORE (*Zeit. physikal. Chem.*, 1904, **47**, 418—444. Compare Löb, Abstr., 1903, i, 20).—Nitrobenzene has been reduced in alkaline solution with a cathode of platinum, copper, tin, zinc, lead, or nickel, or with a platinum cathode + the hydroxide of tin, zinc, or lead. The cathode potential difference has been kept the same throughout, and under these conditions the same reduction products in approximately the same quantities are obtained whatever be the material of the electrode. In other words, it is the cathode potential that is the measure of the reducing energy. This is in agreement with Haber's views, but the authors reject the grounds on which these are based, and suggest a more adequate conception of the mechanism of reduction.

J. C. P.

General Relations between the Heat of Combustion of Organic Compounds and their Constitutional Formula. Calculation of the Heats of Combustion. PAUL LEMOULT (*Ann. Chim. Phys.*, 1904, [viii], 1, 496—553).—A *résumé* of work already published (compare Abstr., 1903, ii, 410; this vol., ii, 12). M. A. W.

Use of Acetylene Gas for Heating Germinating Stoves by means of an Automatic Temperature Regulator. H. JOFFRIN (*Compt. rend.*, 1903, **138**, 817—819).—The temperature regulator described and depicted in the paper maintains the temperature between two limits by extinguishing the flame at the maximum and rekindling it at the minimum temperature. The arrangement consists essentially of a long alcohol thermometer communicating with a U-tube of mercury, the two fixed rigidly to a horizontal beam capable of oscillating about a knife edge in the centre, and carrying at one end a reservoir of mercury which feeds another U-tube through which the acetylene passes. The expansion and contraction of the alcohol raises or lowers the beam, and the gas supply is thereby cut off and the flame extinguished, or turned on and rekindled by a neighbouring permanent flame. There are mechanical arrangements by means of which the amplitude of the oscillation and therefore the range of temperature can be limited at will. M. A. W.

Law of the Rectilinear Diameter. Relation between Heat of Vaporisation and the Critical Constants. GERRIT BAKKER (*Zeit. physikal. Chem.*, 1904, **47**, 231—232. Compare *Zeit. physikal. Chem.*, 1895, 18, 646).—A criticism of Batschinski's treatment (Abstr., 1903, ii, 10) of the above topics. J. C. P.

Vapour Pressures in the System: Benzene, Carbon Tetrachloride, and Ethyl Alcohol. I. FRANS A. H. SCHREINEMAKERS (*Zeit. physikal. Chem.*, 1904, 47, 445—470).—The author has first studied the vapour pressures of the binary systems obtained by taking the three above-mentioned components in pairs. The vapour pressure curves for (1) alcohol and carbon tetrachloride, (2) alcohol and benzene, exhibit maxima. That for benzene and carbon tetrachloride has neither maximum nor minimum. The author has determined also the vapour pressures of a large number of the ternary mixtures, which are all homogeneous. The results may be represented by the usual graphical methods. J. C. P.

Vapour Tension of Liquid Mixtures (for example, of Bromine and Iodine) in Cases where a Partially Dissociated Compound is formed. JOHANNES J. VAN LAAR (*Zeit. physikal. Chem.*, 1904, 47, 129—145).—A theoretical paper, unsuitable for abstraction. J. C. P.

More Exact Equation of Condition for Gases. J. B. GOEBEL (*Zeit. physikal. Chem.*, 1904, 47, 471—489).—The author has arrived at the equation $p = RT/(v-b) - a/(v-\alpha)^2$, in which p, v, R, and T have their usual significance. The quantity b is in general variable with the pressure, and $= b_0 - b_1p$, but the values of a, α, b_0, and b_1 vary only with the nature of the gas under consideration. Tested over a considerable range of temperatures and volumes, the formula gives values of p in satisfactory agreement with the experimental work of Amagat and others on carbon dioxide, ethylene, and nitrous oxide. The critical constants may also be calculated in close agreement with the experimentally determined values for the above gases as well as for nitrogen, oxygen, and air.

The following table shows the values of the constants for the various gases:

	R.	a.	α.	b_0.	b_1
Carbon dioxide...	0·003681	0·00734	0·00044	0·00238	0·0
Ethylene	0·003684	0·00917	0·00068	0·00329	0·0
Nitrous oxide ...	0·003682	0·00749	0·00044	0·00238	0·0
Nitrogen	0·003664	0·00281	0·00068	0·00250	$0{\cdot}0_{5}13$
Oxygen	0·003666	0·00272	0·00060	0·00205	$0{\cdot}0_{6}9$
Air	0·003665	0·00279	0·00065	0·00236	$0{\cdot}0_{5}11$

The values of the critical constants involved in the respective equations are as follows:

	t_k.	p_k.	v_k.
Carbon dioxide ...	31°	72	0·00626
Ethylene	10	50	0·00850
Nitrous oxide ...	36·4	73·1	0·00628
Nitrogen	−145	33	0·00602
Oxygen...	−117	50·8	0·00482
Air	−138	37	0·00566

J. C. P.

Cryoscopic Researches on Solutions of Gases in Liquids. Felice Garelli and Pietro Falciola (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 110—118).—The authors have determined the depressions of freezing point caused by dissolving varying proportions of gases in certain solvents. For a saturated solution of hydrogen sulphide in water, the depression is slightly greater than the normal value ($i = 1·09$), so that at the freezing point of such a solution, hydrogen sulphide is dissociated to only a small extent; the dissociation increases moderately rapidly with the dilution. With solutions of carbon dioxide in water, containing from 0·25 to 0·35 gram of the gas per 100 grams of solvent, a constant and slight dissociation ($i = 1·11$) is observed. In benzene, carbon dioxide and acetylene exhibit the normal molecular weights within fairly wide limits of concentration.

By the same method, the coefficients of absorption of hydrogen sulphide, carbon dioxide, acetylene, and nitrous oxide in various solvents have been measured, the grams of gas dissolved per 100 grams of solvent being given in the following table:

	Temperature.	H_2S.		CO_2.		C_2H_2.		N_2O.	
		Maximum depression.	Concentration.	Maximum depression.	Concentration.	Maximum depression.	Concentration.	Maximum depression.	Concentration.
Water	0·0°	0·395°	0·658	0·165°	0·350	0·08°	0·1118	0·105°	0·2483
Benzene	5·5	—	—	0·770	0·664	1·440	0·734	0·725	0·6255
Bromoform......	7·0	—	—	0·200	0·061	0·581	0·1050	—	—
Acetophenone..	16·0	0·50	0·302	0·560	0·440	1·493	0·697	0·255	0·2003
Acetic acid......	15·5	—	—	0·930	1·049	1·048	0·6984	—	—
Formic acid ...	7·5	—	—	0·530	0·904	0·402	0·3720	—	—

These values agree well with those found by direct measurement of the absorbed gases.
T. H. P.

Influence of Temperature and Pressure on the Absorption and Diffusion of Hydrogen in Palladium. G. N. St. Schmidt (*Ann. Physik*, [iv], 13, 747—769).—It is found that the volume of hydrogen absorbed by palladium increases with fall of temperature to about 140°; below this, concordant results are not obtained. The absorption curve between about 140° and 300° is approximately a straight line, but the accuracy of the experiments is not such as to show if the curve is rigorously linear. The absorption is found to increase with pressure. The diffusion, however, increases with temperature as well as with pressure. Numerous tables of results are given, the temperatures varying from about 150° to 300°, and the pressure from 100 mm. to 300 mm. The author considers that the temperature curve is probably quadratic, but no numbers are given in verification. The pressure curve for the higher pressures is probably linear.

He does not consider Winkelmann's assumption of the dissociation of the hydrogen molecules to be necessary (Abstr., 1902, ii, 552). L. M. J.

Compressibilities of Oxygen, Hydrogen, Nitrogen, and Carbon Monoxide between One Atmosphere and Half an Atmosphere of Pressure, and on the Atomic Weights of the Elements concerned. Lord Rayleigh (*Proc. Roy. Soc.*, 1904, 73, 153—154).—A complete account of the method is deferred; the results obtained for the quotients of the values of *pv* at the half atmosphere by the corresponding values at the whole atmosphere were: oxygen, 1·00040; hydrogen, 0·99976; nitrogen, 1·00017; carbon monoxide, 1·00028. The ratio of the densities at great rarefaction is calculable from these, and it is found the correction factors are, hydrogen, 1·00128; nitrogen, 1·00046; carbon monoxide, 1·00024; oxygen being taken as the standard. It follows that at atmospheric pressure the volume of hydrogen which combines with one volume of oxygen should be 2·0026 volumes, a number in good accord with the value 2·00245 found by Scott, and 2·0027 found by Morley. The densities at atmospheric and very small pressures respectively, referred to oxygen = 16, are: hydrogen, 1·0075, 1·0088; nitrogen, 14·003, 14·009; carbon monoxide, 14·000, 14·003. The value 14·05 obtained by Stas for nitrogen hence appears impossible if Avogadro's law be strictly true. L. M. J.

Diminution of the Density of Certain Substances Induced by Compression and the Cause of this Phenomenon. Walthère Spring (*Rec. trav. chim.*, 1904, 23, 1—15).—In a previous communication (Abstr., 1884, 256), the author has shown that lead, zinc, ammonium sulphate, and ammonium alum, when strongly compressed, exhibit a diminished density. These observations have been extended to various metals by Kahlbaum, Roth and Siedler (Abstr., 1902, ii, 259), and to steel by Grunmach (*Ann. Phys. Chem.*, 1889, 67, 227). It is now shown that specimens of lead, tin, cadmium, and silver which have been forced through small apertures under pressure exhibit slight diminutions from the normal densities of these metals, whereas bismuth, similarly prepared, shows an increase in density. Further, when two plates of the same metal, one having been compressed and the other being the metal in the normal condition, are simultaneously placed in an electrolyte, a slight permanent current is produced, in one direction with the first four metals, which expand on liquefaction, and in the opposite direction for bismuth, which contracts when liquefied. Other slight changes in physical properties are also induced by strong compression.

The author suggests that these changes in density are due to the assumption by these substances under compression of the molecular condition characteristic of the liquid state. T. A. H.

[Phase Rule.] Alfred Byk (*Zeit. physikal. Chem.*, 1904, 47, 223—227. Compare this vol. ii, 16).—A reply to Wegscheider (this vol., ii, 112). J. C. P.

Elementary Demonstration of the Phase Rule. C. Raveau (*Compt. rend.*, 1904, 138, 621—623).—A theoretical paper, unsuitable for abstraction. M. A. W.

Simple Proofs of the Phase Rule. Auguste Ponsot (*Compt. rend.*, 1904, 138, 690—693).—It is shown that the phase rule can be proved in three ways. Firstly, by considering the osmotic pressure exerted by each component in a fluid medium which is separated from the phase by a semi-permeable membrane; secondly, when the volume concentration of each component and the temperature of equilibrium are given; and thirdly, from the equilibrium temperature and the vapour tensions of the components. S. S.

Thermometric Analysis of Solid Phases. E. S. Shepherd (*J. Physical Chem.*, 1904, 8, 92—115).—Bancroft has indicated a method for the determination of the composition of solid phases and the investigation of a three component system (Abstr., 1902, ii, 495). The author has applied this method in an examination of the results of Heycock and Neville on the freezing points of alloys of gold, cadmium, and tin (Trans., 1891, 936). In many cases, the temperatures, however, are not freezing points, but those at which a *second* solid phase appears. Numerous diagrams are given and many references to the original paper. The examination indicates the existence of a quintuple point at 20·9°, where the phases AuCd, $AuCd_3$, Sn, liquid, and vapour co-exist, and a second quintuple point at 18·74° where the phases are Au, AuCd, Sn, liquid, and vapour. By extrapolation along different division lines, the composition of the fused mass at each of these quintuple points is approximately obtained. The various fields where 2 solid phases co-exist are determined as far as possible and indicated in the diagrams. The determinations of the composition of the solid phases by Bancroft's method indicate the existence of 2 alloys represented by the formulæ AuCd and $AuCd_3$; the second of these was not suspected by the original authors. No ternary compound of the three elements is indicated. L. M. J.

The Properties of the Curves representing the Indifferent States. E. Ariès (*Compt. rend.*, 1904, 138, 806—809. Compare Abstr., 1903, ii, 589; this vol., ii, 16, 110).—A mathematical paper from which the following conclusion is drawn: the curves of the indifferent states of two systems the variabilities of which differ by unity are tangential to one another at those points indicating a temperature and pressure when they are both in an indifferent state, and capable of being derived the one from the other by the mere suppression or introduction of a determined phase. Thus, the indifferent state of a bivariant system can be considered as originating in a univariant state of $q+1$ phases by the suppression of a phase, and similarly the univariant state can be considered as taking its origin in an invariant state. M. A. W.

Conception of Independent Components. Johannes J. van Laar (*Zeit. physikal. Chem.*, 1904, 47, 228—230. Compare Abstr., 1903, ii, 536).—A reply to Wegscheider's criticism (this vol., ii, 17). J. C. P.

Theory of Reaction Velocity in Non-homogeneous Systems. WALTHER NERNST (*Zeit. physikal. Chem.*, 1904, 47, 52—55).—The author argues in favour of the view that at the common surface of two phases equilibrium is established with very great rapidity, and that what is actually measured is the rate of the subsequent diffusion throughout the phases. This principle, enunciated first by Noyes and Whitney (Abstr., 1897, ii, 479) in connection with a physical change, is now applied to chemical and electrochemical reactions. In such a case as the solution of magnesia in acids, it is assumed, in accordance with the foregoing, that the solution in immediate contact with the magnesia is saturated with this substance, and therefore slightly alkaline. The rate of solution of the magnesia is then simply the rate at which the acid diffuses to the common surface; if the acid is thoroughly stirred, the fall of concentration will be confined to a thin layer of the thickness δ, surrounding the solid magnesia. For a given temperature, a given apparatus, and a given rate of stirring, δ will be constant and may be determined once for all.

The same reasoning is applied to electrochemical cases, where the common surface is that of an electrode, and where the velocity of reaction (for example, the reduction of iodine) is determined by the rate of diffusion of the reacting substance towards the electrode. In order that the same formulæ may be valid as in the purely chemical cases, it is necessary that the concentration of the reacting substance at the electrode be kept very small, and this is effected by making the *E.M.F.* suitably large. Here also the stirring must be uniform and thorough.

In view of the part played by diffusion in such cases as the above, the author casts doubt on van't Hoff's method of determining the order of a reaction in non-homogeneous systems. J. C. P.

Velocity of Reaction in Non-homogeneous Systems. ERICH BRUNNER (*Zeit. physikal. Chem.*, 1904, 47, 56—102).—Nernst's application (see preceding abstract) of Noyes' and Whitney's theory (Abstr., 1897, ii, 479. Compare also Bruner and Tolloczko, Abstr., 1901, ii, 10; 1902, ii, 62; 1903, ii, 470) to chemical and electrochemical reactions, as well as to purely physical changes in non-homogeneous systems, is subjected to an experimental investigation.

The author has first determined the rate of solution of benzoic acid in water, a cake of the acid (obtained by fusion) being supported in a porcelain crucible lid, and the surrounding water being thoroughly mixed by a screw stirrer revolving from 110—205 times per minute. The rate of solution is given by the value of A, which, for a given temperature and rate of stirring, $= v/\Delta t.\log(C - c_1)/(C - c_2)$, where v is the volume of the solution, C the concentration of the saturated solution, c_1 and c_2 successive values of the concentration at an interval of time Δt. The value of A is proportional to $(n)^{\frac{2}{3}}$, where n is the number of revolutions made by the stirrer per minute. By this relationship it is possible to reduce the values of A obtained in different reactions with different values of n to a common basis.

According to the theory, the rate of solution of magnesium hydroxide in benzoic acid should be the same as that of benzoic acid itself in water under equal conditions of temperature, apparatus, and stirring, for both depend on the same thing, namely, the rate of diffusion of the benzoic acid. The author finds an approximate agreement. More generally, the velocity of reaction should be independent of the nature of the solid substance, provided only that the concentration of the diffusing substance is practically zero at the surface of the former. In harmony with this, it is found that the rates of solution of basic magnesium carbonate, magnesium hydroxide, and magnesium itself in benzoic acid are approximately equal. Magnesium and magnesium hydroxide dissolve equally rapidly in hydrochloric acid; with marble, however, as the solid, A is about 40 per cent. greater. The velocity of electrolytic separation of hydrogen at a platinised platinum electrode from solutions of benzoic and hydrochloric acids containing excess of potassium chloride, is within certain limits equal to the rate of solution of magnesium hydroxide. The values of A obtained (1) for a solution of iodine made into a paste with gum tragacanth, (2) for the electrolytic reduction of iodine solutions at a platinum cathode, were as 3 : 4, both experiments being made in normal potassium chloride solution containing varying quantities of potassium iodide. In view of the irregular rate of solution of solid iodine, this result is regarded as satisfactory.

Comparison of the values of A for the solution of magnesium hydroxide in different acids in presence of their magnesium salts shows that they increase in the following series: benzoic, acetic, formic, hydrochloric acids. If these acids were arranged according to the magnitude of their diffusion coefficients, the order would be the same as that just given. That benzoic acid dissolves magnesium hydroxide more slowly than acetic acid, although it is the stronger acid, is a fact in favour of the diffusion theory.

The value of δ (see Nernst, preceding abstract), as calculated from the author's experiments at 20°, varies from 0·018—0·052 mm. when the stirrer revolves 150 times per minute. A few experiments showed that the value of A at 30° was one and a half times greater than the corresponding value at 20°. As the temperature rises, δ diminishes, in virtue of the lower viscosity of the solutions. J. C. P.

A Reaction the Rate of which is Diminished by Rise of Temperature. CLARA C. BENSON (*J. Physical Chem.*, 1904, 8, 116—121).—Some of the author's former experiments on reactions in solutions containing chromic acid, potassium iodide, and ferrous sulphate (Abstr., 1903, ii, 200) had indicated that the rate of liberation of iodine was less at 30° than at 0°. This is further investigated and verified, whilst the experiments indicate that the course of the reaction is similar in both cases, being proportional to the first power of the concentrations of the iodide and ferrous salt and to the 1·7th power of that of the dichromate.

The author suggests two possible explanations, but has not made experiments to test the validity of either. L. M. J.

Determination of Avidity by the Polarimetric Method. JAMES WALKER (*Zeit. physikal. Chem.*, 1903, 46, 30—36).—The rotation of an approximately seminormal solution of *l*-mandelic acid is $-22{\cdot}70°$, that of the equivalent solution of sodium mandelate is $-17{\cdot}07°$. The free mandelic acid is dissociated to about 3 per cent., and when this is repressed to 0·4 per cent. by adding hydrochloric acid, the rotation is $-22{\cdot}92°$. The rotation of a solution containing the same equivalent quantities of mandelic acid and sodium acetate is $-18{\cdot}07°$. Hence the sodium is distributed between the acetic and mandelic acids in the ratio 0·206 : 1·0; this agrees closely with the square root of the ratio of the dissociation constants of the two acids. The method has been tested, also with satisfactory results, for the case in which the inactive acid (malonic) is stronger than the active acid (*l*-mandelic). Using *l*-mandelic acid as a standard, the relative strength of the two inactive acids, acetic and malonic, may then be calculated. By applying this polarimetric method, it may be shown that whilst the primary dissociation constant of malonic acid is greater than that of tartaric acid, the second carboxyl group of malonic acid is much weaker than the second carboxyl group of tartaric acid, in accordance with Ostwald's theory (compare also Smith, Abstr., 1898, ii, 284).

J. C. P.

Equilibrium between Iron, Ferrosoferric Oxide, Hydrogen, and Water Vapour. GERHARD PREUNER (*Zeit. physikal. Chem.*, 1904, **47**, 385—417).—The furnace used was a protected magnesia tube, heated electrically, and inside this was put the porcelain tube in which the reaction took place. Two glass bulbs, containing water and communicating with one another, were connected with the porcelain tube, one at each end. There were also connected a tube to admit of evacuation or admission of hydrogen, and a manometer. The whole apparatus was mounted on a rocking scaffold immersed in water of a constant temperature, the effect of the rocking being to cause a circulation of the gases through the porcelain tube, and thus to secure a more rapid and trustworthy establishment of equilibrium.

According to the equation $3Fe + 4H_2O \rightleftarrows Fe_3O_4 + 4H_2$, p_1/p_2, where p_1 is the water vapour pressure after equilibrium has been reached, and p_2 the hydrogen pressure under the same conditions, should be a constant for a given temperature. This was found to be the case at three temperatures, 900°, 1025°, and 1150°, the mean values of p_1/p_2 being 0·69, 0·78, and 0·86 respectively. In these experiments, p_1 was varied between 8·8 and 49·3 mm., a considerably wider range than was found practicable by Deville, who investigated the equilibrium conditions of the same reaction.

The heat effect of the reaction $3Fe + 4H_2O = Fe_3O_4 + 4H_2$, obtained by inserting the values of the equilibrium constants in van't Hoff's equation, is calculated to be 11,900 cal. at 960°, whilst calculation from calorimetric data gives 42,890 cal. When used in calculating the heat of formation of ferrosoferric oxide, the value 11,900 cal. gives a result much more in harmony with Baur and Glaessner's work (Abstr., 1903, ii, 423) than does the value 42,890 cal.

J. C. P.

Law of Action of Maltase. Influence of the Concentration of Maltose. E. F. TERROINE (*Compt. rend.*, 1904, **138**, 778—779). The velocity of hydrolysis of maltose by maltase (taka-diastase) has been determined by measuring the reducing power of the liquid on Fehling's solution, and also polarimetrically. The influence of the concentration of the maltose is expressed in the formula $v = K.a/(1 + ma)$, where v is the velocity of hydrolysis, a the concentration of maltose (0·5 to 10 per cent.), K and m two constants depending on the conditions of the experiment and of the ferment. The same law obtains in the cases of invertin, emulsin, amylase, and trypsin (compare Henri, Abstr., 1902, ii, 127; 1903, i, 304, 591, 643; ii, 135).

M. A. W.

Action of Maltase. Stability of the Ferment. CH. PHILOCHE (*Compt. rend.*, 1904, **138**, 779—781).—Preparatory to the study of the kinetics of the reversibility of the enzyme action of maltase (compare Hill, Trans., 1898, **73**, 634), the stability of the ferment during the time of the reaction has been determined by measuring the velocity of hydrolysis by maltase of solutions of equal sugar content, but containing different proportions of maltose and dextrose. It was found that the velocity of hydrolysis of a solution containing maltose, 4 per cent., and dextrose, 2 per cent., is the same as that of a 6 per cent. solution of maltose which has been acted on by the ferment for 24 hours; it follows, therefore, that the activity of maltase (taka-diastase) at 40° does not change during the first 24 hours.

M. A. W.

Theory of Catalytic Reactions. HANS EULER (*Zeit. physikal. Chem.*, 1904, **47**, 353—356. Compare Abstr., 1900, ii, 532; 1901, ii, 57).—A criticism of Kullgren's recent paper (Abstr., 1903, ii, 535). In studying the influence of acids on the rate of inversion of sucrose, account must be taken of the dissociation of sucrose, either (1) into a lævulose ion and a dextrose ion, or (2) into the cathion, $C_{12}H_{21}O_{10}^{\cdot}$, and the anion, OH′. A fuller treatment of the subject is promised.

J. C. P.

Palladium Catalysis of Hydrogen Peroxide. GEORG BREDIG and MAX FORTNER (*Ber.*, 1904, **37**, 798—810).—The temperature employed was 25°, the hydrogen peroxide was titrated with permanganate, and the colloidal palladium was prepared by electrical powdering of palladium wire under N/1000 sodium hydroxide. The action is unimolecular and obeys a simple logarithmic law, but different preparations of palladium of the same concentration vary considerably in their activity. The catalytic action of the palladium (in presence of N/60 sodium hydroxide and N/10 hydrogen peroxide) can be distinctly noticed when the concentration of the palladium is only 1 gram atom to 26 million litres of solution.

Alkalis have an accelerating effect which reaches a maximum at intermediate dilutions, as is shown by the following table, which gives the times t_{50} for 50 per cent. decomposition at different concentrations:

N/100000 Pd + N/10 H_2O_2

+NaOH.	N.	N/2.	N/4.	N/16.	N/64.	N/256.
t_{50} (minutes)	48	28	15	10	19	33

In acid solutions, the decomposition is exceedingly slow.

Hydrogen considerably increases the activity of the palladium; in one experiment, the amount of decomposition in 18 minutes was increased from 25 to 96 per cent. by bubbling a little purified hydrogen through the colloidal palladium suspension. This effect is much too great to be due to oxidation of the absorbed hydrogen by hydrogen peroxide, and must depend on some alteration in the surface of the palladium. Prolonged action of hydrogen coagulates the palladium, with formation of a hydrogen alloy, but when this is oxidised again by hydrogen peroxide, the palladium or its oxide obtained is naturally in a still finer state of division, and the active surface therefore increased. Carbon monoxide at first retards and then greatly accelerates the catalytic action of the palladium; this is explained as being due to the "poisoning" of the metal by carbon monoxide and subsequent oxidation to carbon dioxide, leaving the metal in a state of increased activity.

Iodine acts as an anticatalyst; the addition of *N*/107 iodine to *N*/13200 palladium reduced the velocity of decomposition by 25 per cent. Hydrogen sulphide has a retarding effect, probably owing to the conversion of palladium metal into sulphide and mercuric chloride; hydrogen cyanide and hydrogen arsenide have a somewhat similar effect.

T. M. L.

Catalysis of Hydrogen Peroxide by Iodine Ions. James Henri Walton, jun. (*Zeit. physikal. Chem.*, 1904, 47, 185—222).—A method has been worked out whereby it is possible to measure at intervals the oxygen that has been evolved from a mixture of potassium iodide and hydrogen peroxide solutions, and thus to determine the rate of decomposition of the peroxide. The decomposition proceeds as a reaction of the first order, and the velocity is proportional to the concentration of the iodine ions, as shown by experiments with potassium, sodium, ammonium, and cadmium iodides. Hence the addition of any substance (such as iodine or mercuric iodide) which removes iodine ions by forming complexes retards the catalysis. On the supposition that potassium tri-iodide is catalytically ineffective, it is possible to calculate the amount of free iodine in close agreement with Jakowkin (Abstr., 1894, ii, 271; 1896, ii, 514). Addition of alkali retards the decomposition of hydrogen peroxide by iodine ions, and the order of the reaction is altered. The influence of normal salts, such as potassium chlorate, nitrate, sulphate, chloride, sodium sulphate and chloride, on the catalysis is only slight. The formation of iodate or periodate as an intermediate product of the catalysis is improbable, since neither salt intensifies the catalytic effect of potassium iodide on the decomposition. On the other hand, it is probable that hypoiodite is formed as an intermediate product, although from conductivity and freezing point experiments it appears that the quantity of hypoiodite present at any moment is relatively small. The velocity of the catalysis is approximately doubled for a rise of 10° in temperature.

J. C. P.

Indicators for Acids and Alkalis. W. Salessky (*Zeit. Elektrochem.*, 1904, 10, 204—208).—The potential difference between two hydrogen electrodes is measured. The one electrode dips into normal hydrochloric acid, the other into a solution of the indicator, to which acid or alkali is added until the change of colour just takes place. By means of Nernst's formula for the *E.M.F.* of a concentration cell, the concentration of the hydrogen ions in the indicator solution is readily calculated.

The following table contains the results obtained. The concentrations are given in gram-equivalents per litre.

Indicator.	Concentration of hydrogen ions.	Indicator.	Concentration of hydrogen ions.
Methyl-violet	2×10^{-3}	Methyl orange	$1 \cdot 4 \times 10^{-5}$
		,, yellow	1×10^{-7}
Benzopurpurin B.	5×10^{-4}	Turmeric	$1 \cdot 4 \times 10^{-7}$
Fluorescein	$4 \cdot 2 \times 10^{-4}$	Phenolphthalein	1×10^{-7}
		,, red	$3 \cdot 2 \times 10^{-9}$
Gallein	$6 \cdot 3 \times 10^{-5}$	Curcumin W.	$4 \cdot 8 \times 10^{-8}$
Congo-red	6×10^{-5}	Tropæolin 000	1×10^{-8}
Rosolic acid	$5 \cdot 4 \times 10^{-5}$	Litmus, red	1×10^{-5}
Alizarin	$3 \cdot 6 \times 10^{-5}$	,, blue	1×10^{-8}

In most cases, the concentration of the hydrogen ions at which the colour change occurs does not depend on the concentration of the indicator. Methyl orange is an exception; the larger concentration was found for 1/20000 to 1/500000*n* solutions, and the smaller value for 1/4000 to 1/6000*n* solutions. T. E.

Indicators for Acids and Alkalis. Bruno Fels (*Zeit. Elektrochem.*, 1904, 10, 208—214).—Referring to Salessky's work (preceding abstract), the author points out that a ten-fold increase in the concentration of the hydrogen ions in the concentration cells measured only increases the *E.M.F.* by 0·058 volt; it is therefore desirable to test the accuracy of the results by another method. When a solution of a salt of a weak base or acid is mixed with a solution of the free base or acid, a solution is obtained in which the concentration of the hydrogen ions can be calculated from the known dissociation constants of water and of the base or acid. The concentration of the hydrogen ions in such solutions is practically unaffected by the presence of traces of impurities in the water and salts used, which is very far from being the case with very dilute solutions of strong acids or alkalis. Many of the results obtained by Friedenthal (this vol., ii, 288) are uncertain owing to the latter circumstance. The solutions used are (*a*) mixtures of ammonia and ammonium chloride, $[H^{\cdot}] = 10^{-8}$ to 10^{-10}; (*b*) sodium acetate and acetic acid, $[H^{\cdot}] = 10^{-4}$ to 10^{-6}; (*c*) sodium phthalate saturated with phthalic acid, $[H^{\cdot}] = 10^{-2}$ to 10^{-4}; sodium *p*-nitrophenol saturated with *p*-nitrophenol, $[H^{\cdot}] = 10^{-7}$ to 10^{-8}. Curves are given showing the connection between the composition of the solutions and the concentration of the hydrogen ions. By means of these solutions, the exact concentration of hydrogen ions at which the change of colour of the indicator occurs is easily found (with the yellow phenol solutions, the spectroscope was used). The results obtained are as follows:

Indicator.	Colour change.	Concentration of hydrogen ions $[\mathrm{H}^{\cdot}]$.
Tropæolin 000	Orange to red	$10^{-11.2}$
Phenolphthalein	Red	$10^{-7.76}$
,,	Colourless	$10^{-7.50}$
Curcumin W.	Red	$10^{-7.62}$
Litmus	Blue to red	$10^{-6.97}$
p-Nitrophenol	Yellow	$10^{-6.74}$
,,	Colourless	$10^{-6.13}$
Methyl-orange	Yellow	$10^{-5.23}$
,,	Orange	$10^{-4.07}$
,,	Red	$10^{-3.3}$
Congo-red	Red to intermediate colour	$10^{-4.41}$
,,	Blue to intermediate colour	$10^{-3.76}$
Methyl-violet	Violet	$10^{-2.38}$
,,	Blue	$10^{-2.05}$

The results agree fairly well with those obtained by Salessky. It is pointed out that, within the usual limits, the concentration of the indicator does not affect the point at which the colour change takes place. The colour of a methyl-orange solution remains practically unchanged over a fairly wide range of concentrations, hence its indications are not very sharp. The concentration of the hydrogen ions in a neutral solution is about 10^{-7}, which is the concentration of the hydrogen ions in pure water. T. E.

Solubility and Size of Grain. George A. Hulett (*Zeit. physikal. Chem.*, 1904, 47, 357—367. Compare Ostwald, Abstr., 1900, ii, 712; Hulett, Abstr., 1901, ii, 493).—By way of reply to Kohlrausch (Abstr., 1903, ii, 528), the author confirms and supplements his earlier experiments on the variation in the solubility of calcium and barium sulphates with the state of division of the solids. In general, the influence of the size of grain on the solubility of a substance is negligible when the solubility exceeds 2 per cent. The increase of the normal solubility that may be temporarily observed by using finely divided solid amounts to 20 per cent. in the case of calcium sulphate, and 80 per cent. in the case of barium sulphate. J. C. P.

[Solubility and Size of Grain.] Friedrich Kohlrausch (*Zeit. physikal. Chem.*, 1904, 47, 625—626).—A reply to Hulett (preceding abstract). J. C. P.

Influence of Temperature on the Solubility of Certain Compounds in Sulphur Dioxide. Mieczyslaw Centnerszwer and I. Teletoff (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 62—71).—The authors have examined the solubilities, at different temperatures, of anthracene, anthraquinone, and quinol in liquid sulphur dioxide. The substance was heated with the dioxide in a thick-walled, sealed, glass tube, which was well shaken and the temperature noted at which the solid disappeared. At high temperatures, the solubilities increase very quickly, the curves being approximately asymptotic to lines parallel to the axis of solubility. On increasing the concentration of the solution by 1 per cent., its critical temperature is raised by 5°, so that, with these three substances, the solubility becomes infinitely greater before the critical temperatures of their saturated solutions are reached. The authors denote by "mean solubility" the relation $(s+\sigma)/(l+\lambda)$, where s and σ denote the quantities of the substance dissolved in the liquid sulphur dioxide (of weight l) and the vapour (of weight λ) respectively. By calculations based on the phase rule, the conclusion is arrrived at that the mean solubility of any difficultly volatile substance is not a constant magnitude at any particular temperature, but increases with an increase in the proportion of the tube filled with the liquid.

Taking a tube filled to a certain fraction (0·26) of its volume with liquid sulphur dioxide, it is found that, if the concentration of anthraquinone is less than a certain limit (8·8 per cent.), the temperature of complete solution lies below that at which the meniscus disappears. If, however, the concentration of the anthraquinone solution in the tube equals or exceeds 8·8 per cent., the following four definite temperatures are observed: (1) Temperature at which the meniscus first disappears. (2) Temperature of re-appearance of the meniscus. (3) Temperature of complete solution. (4) Temperature of the second disappearance of the meniscus. This phenomenon is one of "retrograde condensation" (condensation on heating and evaporation on cooling) taking place in a system of three phases and with a constant volume for the whole system. If 0·35 of the volume of the tube is filled with solution, similar retrograde condensation is observed, but this is not the case when the liquid occupies 0·41 or 0·51 of the enclosed volume, the temperature of complete solution then lying well below that at which the meniscus disappears. When the fraction reaches 0·61, the meniscus disappears at the upper end of the tube; if the concentration is less than 17 per cent., the temperature of solution is lower than that of the disappearance of the meniscus, but if more than 17 per cent. of the anthraquinone is present in the solution, the meniscus disappears at a lower temperature than that of complete solution. T. H. P.

Apparatus for the Determination of the Solubility of Salts in Liquids other than Water and at Temperatures above 100°.

H. Cantoni (*Ann. Chim. anal.*, 1904, 9, [iii], 81—83).—A modification of Durand's apparatus. It consists of a receiver made of Jena glass of 1250 c.c. capacity. The large neck is fitted with a doubly-perforated rubber cork, one hole of which is eccentric. Through the central opening passes the tube of a condenser, in which rotates freely the stem of a stirrer; this dips into the receiver and agitates the suspended substance the degree of solubility of which must be determined.

Through the eccentric hole passes a glass tube communicating with a small porcelain hollow cylinder of 50—60 mm. diameter, which dips into the receiver. The lower part of this cylinder is perforated with several small holes. In the interior of this tube is placed a plug of glass-wool, then some asbestos up to the height of the perforated part. This arrangement serves as a filter.

The whole is immersed in a bath furnished with a stirrer, a thermometer, and, at the bottom, with a semi-cylindrical chamber with an internal tubulus, through which passes the stem of a glass siphon; this communicates with the porcelain cylinder which dips into the liquid and serves as a filter.

The bath is filled with oil so as to readily obtain temperatures above 100°. The central stirrer constantly keeps this oil in motion, causing an equal temperature throughout the bath. The temperature is kept constant by means of a mercury-regulator.

The different stirrers are kept going by means of an electric motor. At the end of the operation it is sufficient to set the siphon going by means of an aspirator to collect the different solutions, which are then analysed.

Three operations may be conducted at the same time. A full illustration of the apparatus is given. L. DE K.

Method of Stating the Concentration of Solutions. HARTOG J. HAMBURGER (*Zeit. physikal. Chem.*, 1904, **47**, 495—496).—In an electrolytic solution, the dissolved units comprise both molecules and ions, whilst the concentration as usually stated refers only to the total number of molecules. The author, from the standpoint chiefly of the physiologist and pathologist, shows the need for such a term as "osmotic concentration," indicating by this the number of gram-molecules + gram-ions per litre of solution. As a contraction for the phrase "gram-molecules + gram-ions," he proposes the word "molions." The concentration of a solution as thus stated is directly deducible from its freezing point. J. C. P.

The Amide Group. CHARLES E. FAWSITT (*Proc. Roy. Soc. Edin.*, 1904, **25**, 51—60. Compare Abstr., 1903, ii, 15).—The viscosity of aqueous solutions of (1) carbamide, (2) acetamide, varies as required by the formula $\eta_x = A^x$, where A is a constant and η_x the viscosity at the concentration x. The author cannot confirm Rudorf's statement (Abstr., 1903, ii, 403) that carbamide in dilute aqueous solution shows a negative viscosity.

The molecular conductivity of hydrochloric acid, to which gradually increasing quantities of carbamide have been added, diminishes rapidly; the molecular conductivities of potassium chloride and sodium hydroxide under the same conditions are diminished only to a slight extent, which is about the same for each electrolyte. It may therefore be concluded that amides do not possess any acidic character, and that their general formula is $O{:}CR{\cdot}NH_2$ rather than $OH{\cdot}CR{:}NH$.

The viscosities and conductivities of a potassium chloride solution to which increasing quantities of carbamide have been added are found on comparison to be very closely related.

The non-conductivity of amides in aqueous solution is a good criterion of their purity. J. C. P.

Separation of Solids in the Surface Layers of Solutions and Suspensions. (Observations on Surface Membranes, Bubbles, Emulsions, and Mechanical Coagulation.) W. RAMSDEN (*Proc. Roy. Soc.*, 1903, **72**, 156—164).—In continuation of his previous experiments (Abstr., 1895, i, 254), the author has found that, apart from evaporation, solid or highly viscous coatings are spontaneously formed on the free surfaces of all proteid solutions, of many non-proteid colloid solutions, of fine and coarse suspensions, and of a few apparently crystalline solutions. Similar coatings are formed at the common surface of two liquids, which, without being highly viscous, form persistent emulsions. The explanation of such a separation of previously dissolved matter at the free surfaces of solutions is sought in the observation that all solutes which so accumulate, lower the surface tension of water. The accumulation of solid or highly viscous matter on the surface of their solutions has been shown for a large number of substances by (1) the formation of mechanical surface aggregates, (2) the occurrence of intense special superficial viscosity, or (3) the formation of persistent bubbles. There is very considerable parallelism in the three phenomena. J. C. P.

Reciprocal Pairs of Salts. WILHELM MEYERHOFER (*Ber.*, 1904, 37, 1116—1120. Compare this vol., ii, 170).—A reply to Witt and Ludwig (*ibid.*, ii, 171). The author makes use of the phase rule, and concludes that the solution plays no part, but that the reactions occur between the solids. J. J. S.

Mutual Relationships of Colloids in Solution. WILHELM BILTZ (*Ber.*, 1904, 37, 1095—1116. Compare Picton and Linder, Trans., 1897, 71, 572; Lottermoser, *Ahren's Sammlung*, 1901, 76; Spring, Abstr., 1900, ii, 713),—Directions are given for the preparation of colloidal solutions of platinum, gold, selenium; of cadmium, antimony, and arsenic sulphides; of silicic acid, stannic acid, molybdenum oxide, Mo_3O_8, tungsten blue, vanadium pentoxide, and hydroxides of cerium, zirconium, thorium, chromium, aluminium, and iron (Abstr., 1903, ii, 153). All the hydrosols, with the exception of the hydroxides, are attracted towards the anode. When a current is passed through the colloidal solution, the hydroxides mentioned above, on the other hand, are attracted towards the cathode. It appears that hydroxyl compounds are positively charged, but the other colloids negatively.

Oppositely charged hydrosols are able to precipitate one another in the absence of an electrolyte, and the precipitate obtained consists of a gelatinous mass of the two hydrosols (*adsorption compounds*). Hydrosols with similar charges cannot precipitate one another except in the presence of an electrolyte. Even with oppositely charged hydrosols, precipitation only occurs within certain limits of concentration. If the solutions are too concentrated or too dilute, no precipitate is formed.

The fact that the power of precipitation of negatively charged colloids by salt solutions increases considerably with the valency of the cathion of the salt employed (Schulze, Abstr., 1882; Linder and Picton, Abstr., 1895, 67, 63; Freundlich, *ibid.*, 1903, ii, 532) is in perfect harmony with the view that the precipitation is caused by the presence of colloidal metallic hydroxides in the aqueous solutions of the salts. The same generalisation does not apply to positively charged hydrosols; for example, five c.c. of colloidal ferric hydroxide solution were mixed with 0·5 mol. normal solution of different salts with the following results: Potassium chloride, after 2 hours, slight turbidity. Barium chloride, after 1 hour, copious turbidity. Aluminium chloride, after 2 days, no turbidity. J. J. S.

Colloidal Solutions. Application of the Phase Rule to the Precipitation of Colloids. VICTOR HENRI and ANDRÉ MAYER (*Compt. rend.*, 1904, 138, 757—760).—The phase rule can be applied to the study and systematic classification of the conditions of precipitation of colloidal solutions, whether such solutions are regarded as consisting of two phases, namely, small granules suspended in a liquid, or of one phase; the precipitation of (1) colloidal copper ferrocyanide by copper nitrate; (2) colloidal silver by colloidal ferric hydroxide; and (3) proteid substances by acids, copper, or silver salts, are all reversible reactions, the precipitate dissolving in the excess of the reagent. Further, it is possible in the case of a proteid and copper sulphate for certain concentrations to obtain a system of three phases: copper sulphate crystals, precipitated albumin *plus* copper, and a solution of albumin and copper sulphate; if the proportion of albumin is increased, the composition of the solution changes, and in accordance with the phase rule the composition of the precipitate also changes. Mixtures of gelatin, water and sodium chlorate, or gelatin, water and sodium chlorate, or gelatin, water and copper sulphate behave similarly, giving rise to systems of two or three phases.
M. A. W.

The Coagulation of Colloidal Solutions. JACQUES DUCLAUX (*Compt. rend.*, 1904, 138, 809—810. Compare this vol., ii, 162, 243).—The electropositive radicles differ greatly in the ease with which they replace chlorine in colloidal ferric hydroxide $[Fe_2(OH)_mCl_n]$; hydroxyl is the most active, and the bivalent are much more active than the univalent radicles; thus the displacing power of sulphuric is at least 20 times as great as that of nitric acid, or, in other words, in order to coagulate a given volume of the colloidal solution, it would require a much larger quantity of hydrochloric or nitric than of sulphuric acid. The coagulation is accompanied by a definite change in the composition of the solution which is independent of the nature of the acid. This chemical modification is to be regarded as the cause of the coagulation, for there exists initially a state of chemical equilibrium between the particles of the colloid and the surrounding liquid; the addition of different salts in quantities inversely proportional to their displacing power modifies the composition of the two phases to the same extent, and it follows that when the system has been displaced to a certain extent from its original state of equilibrium, coagulation will set in. M. A. W.

Solution and Swelling ("Quellung") of Colloids. KARL SPIRO (*Beitr. chem. Physiol. Path.*, 1904, 5, 276—296. Compare this vol., i, 124; Pauli, Abstr., 1902, ii, 388; 1903, i, 299; Zsigmondy, *Zeit. Elektrochem.*, 1902, 8, 684).—Hydroxyl and hydrogen ions and colloidal ferric hydroxide solution all accelerate the "swelling" of gelatin, even in the presence of a third substance like dextrose. With dextrose alone, the maximum value is obtained with a 3 per cent. solution. With a 25 per cent. solution of dextrose, practically no water is absorbed, and with still more concentrated solutions the gelatin contracts owing to loss of water.

Milk (dialysed), serum albumin, and colloidal arsenious sulphide do not accelerate "swelling." Other substances, for example, agar plates, are not affected in the same manner as gelatin by colloids. There is no close relationship between swelling and osmotic pressure, and there is no hard and fast line between colloids and crystalloids, as certain colloids (for example, egg albumin) can diffuse through plates of gelatin.

Colloidal ferric hydroxide solution, obtained by prolonged dialysis, is a complex material and contains appreciable amounts of chlorine in solution. Part of the substance is undoubtedly present in true solution, but the greater part is merely in fine suspension. Solutions obtained by prolonged dialysis are far less active than commercial solution on gelatin.

The presence of a small amount of an electrolyte in solution appears to be necessary for the formation of a colloidal solution. J. J. S.

Theory of Pseudo-acids. HUGO KAUFFMANN (*Zeit. physikal. Chem.*, 1904, 47, 618—624. Compare Hantzsch, Abstr., 1899, i, 399; Hantzsch and Barth, Abstr., 1902, i, 222).—According to Hantzsch, one characteristic of a pseudo-acid is that the hydrolysis of the sodium salt has a smaller value than that calculated from the dissociation constant of the free acid. The author's theoretical investigation shows that the law of mass action furnishes no basis for this method of characterising pseudo-acids, and it is found that the hydrolysis of the salts of a pseudo-acid must be as great as that of the salts of an ordinary acid with an equal dissociation constant. The cases of abnormally low hydrolysis, established by Hantzsch's experiments, are probably connected with incomplete electrolytic dissociation of the salts, or with some other factor, the importance of which has not yet been recognised.

J. C. P.

Polymerisation of Orthomeric Liquids, Especially of Acetic Acid. ALEXIUS J. BATSCHINSKI (*Chem. Centr.*, 1904, i, 868; from *Bull. Soc. Imp. Naturalistes Moscou*, 1903, 188—199).—A method of determining the degree of polymerisation of liquids, the vapours of which have the same degree of complexity ("orthomeric" liquids), has already been devised (Abstr., 1902, ii, 444). This method has been applied to the case of acetic acid, methyl formate and fluorobenzene serving as standard substances. The results obtained varied somewhat with the method of calculation employed and the compound chosen for the standard, but were on the whole fairly concordant. The differences are due to the slight polymerisation of the standard substance itself or to the insufficient accuracy of the determination of its critical volume, and to the fact that the law of coincident conditions is not absolutely true. The mean values obtained for the degree of polymerisation are at 100° 1·7, at 150° 1·6, at 200° 1·5, at 250° 1·4, and at 300° 1·3; they are a little lower than those found by Ramsay and Shields, and lie, on the whole, between those found by other observers. E. W. W.

Size of the Molecules of Compounds in the Liquid State. Wilhelm Vaubel (*J. pr. Chem.*, 1904, [ii], 138—144).—The author has calculated the association factor of a number of liquid elements and compounds, both inorganic and organic: by his own method, from the heat of vaporisation and the "gravitation factor"; by Ramsay and Shields' method, from the surface tension; by Traube's method, from the co-volume; and by Longinescu's method, from the absolute boiling point and the density. The results are tabulated. The different methods "on the whole lead nearly always to an approximately correct value." C. F. B.

Theoretical Considerations Respecting the Origin and Essence of the Chemical Elements. Willibald Hentschel (*J. pr. Chem.*, 1904, 69, 187—192).—In the light of recent discoveries with regard to radioactivity, the author discusses his idea, enunciated fifteen years ago, that "matter may be regarded as an accumulation of radiant energy." C. F. B.

Distribution of Elements in the Earth in Relation to their Atomic Weights. Louis De Launay (*Compt. rend.*, 1904, 138, 712—714).—It is suggested, on geological grounds, that the original distribution of the elements in the earth at the time of its fluidity was, from the exterior towards the centre, approximately in the order of their atomic weights, their distance from the centre being greater the smaller the atomic weight. This is the order the atoms, free from all chemical affinity at such high temperatures, would assume as a result of rotation of the fluid mass. L. J. S.

Apparatus for Regulating the Action of Vacuum Pumps. Jean Meunier (*Compt. rend.*, 1904, 138, 693—694).—A valve made from a perforated glass tube covered with a rubber band is inserted between the vacuum pump and the exhausted vessel. This arrangement serves to prevent water being sucked back from the pump during changes in the flow of the current. S. S.

New Forms of Pipettes. B. M. Mukerjee (*Chem. News*, 1904, 89, 161).—Two pipettes are described for use in drawing up bromine, chlorine water, &c. In the first, the upper tube of an ordinary pipette is bent at a right angle and enters the top of a reservoir filled with water. A tube passes to the bottom of this reservoir, and has near the top a large bulb. The pipette is filled by drawing the water from the reservoir into this bulb. A valve may also be placed in the upper tube of the pipette for greater safety. The second example consists of a pipette with the tube above the mark bent into the shape of a U-tube, which is filled with water. W. P. S.

Inorganic Chemistry.

Formation of Solids at Low Temperatures, particularly with regard to Solid Hydrogen. MORRIS W. TRAVERS (*Proc. Roy. Soc.*, 1904, 73, 181—183).—The author has previously found that hydrogen remained liquid down to 14·2° (Helium scale), but solidified when the pressure fell to 49 or 50 mm. of mercury corresponding with a temperature of 14·1°, but no observations of its appearance were made. The experiments have been modified and repeated in order to determine whether the glassy substance described by Dewar is definite crystal or merely a highly viscous liquid. The author found that when the liquid hydrogen was made to boil in a vacuum the liquid did not appear to become viscous, and films of glassy substance formed at the surface and broke as the bubbles rose. The sharpness with which the solid hydrogen was formed and the constancy of the melting pressure lead the author to believe that the solid hydrogen is a crystalline substance and not a pseudo-solid. L. M. J.

Density of Fluorine. HENRI MOISSAN (*Compt. rend.*, 1904, 138, 728—732).—The discrepancy between the experimental (1·260) and the theoretical value (1·316) for the density of fluorine (compare Abstr., 1890, ii, 208) led Brauner to suggest that the gas may be a mixture of atomic and molecular fluorine, a fact which would also account for its great chemical affinity (compare Trans., 1894, 65, 401). The author has therefore redetermined the density of the gas by the Regnault method, using a glass globe in place of the platinum vessel employed in the earlier investigation (compare Abstr., 1900, ii, 140). The glass globe was weighed full of nitrogen, and then full of fluorine, a correction being made for the residual nitrogen. The mean of four determinations gave the number 1·310 for the density of fluorine, a value so closely approximating to the theoretical (1·319), calculated from F = 19·05, as to exclude the possibility of the existence of free atoms in gaseous fluorine. M. A. W.

Preparation and Properties of Liquid Oxygen. ERNST ERDMANN and FRED BEDFORD (*Ber.*, 1904, 37, 1184—1193).—At −191·5°, liquid oxygen dissolves 458 times its volume, or 50·7 per cent. of its weight, of gaseous nitrogen; it is therefore necessary in preparing pure liquid oxygen to carefully exclude air. E. F. A.

Composition and Temperature of Liquid Air. ERNST ERDMANN (*Ber.*, 1904, 37, 1193—1196).—Liquid air freshly drawn from the Hampson machine contains about 30 per cent. of oxygen and boils at about −194°. E. F. A.

Physical Chemistry of the Lead Chamber Process. MAX TRAUTZ (*Zeit. physikal. Chem.*, 1904, 47, 513—610).—The reactions of the lead chamber take place with such great rapidity that a final decision as to their relative importance cannot yet be reached.

The oxidation of sulphur dioxide in aqueous sulphuric acid solutions has been qualitatively studied. The rate of decomposition of nitrosulphonic acid at 25° in aqueous sulphuric acid of varying strength has been determined. In dilute sulphuric acid solutions, what is actually measured is the rate of escape of nitric oxide from a supersaturated solution, the hydrolysis of the nitrosulphonic acid taking place almost instantaneously; when the sulphuric acid is stronger, the rate of hydrolysis is lower, and is superposed on the rate of escape of the nitric oxide.

Nitric oxide acts on the system $HNO_3 + H_2O + H_2SO_4$, forming nitrosulphonic acid and nitrogen peroxide. So long as the percentage of the sulphuric acid is less than 52, the process is reversible at all temperatures between 22° and 82°. The partial pressure of the nitrogen peroxide produced in the foregoing reaction rises with increasing sulphuric acid concentration to a maximum, and then falls off until with 93 per cent. sulphuric acid it has a negligibly small value. There is produced at this concentration not only nitrosulphonic acid, but also nitrosodisulphonic acid the concentration of which is approximately proportional to the nitrogen peroxide concentration.

In the presence of nitric acid, nitric oxide can reduce sulphuric acid to sulphur dioxide—a process to be attributed to successive condensation and resolution (compare Raschig's theory).

Under the conditions of the lead chamber, a reaction takes place between nitrosodisulphonic acid and nitrous acid (also nitrosulphonic acid or its decomposition products), leading to nitric oxide and sulphuric acid; it is probable that this reaction is of considerable importance in the lead chamber process.

Nitrosodisulphonic acid, $NO(SO_3H)_2$, has been prepared in several new ways, and it has been shown that this compound results from the reduction of nitrosulphonic acid by sulphur dioxide in concentrated sulphuric acid, the reduction being accelerated by heating.

It is pointed out that the usual method of determining the nitrogen acids in the chamber gases is faulty, and it is therefore probably not yet known with certainty which oxides of nitrogen predominate in the chamber.

The paper contains a detailed critical and historical review of the literature dealing with the theory of the lead chamber process.

J. C. P.

Catalysis of Hydrazine. ATTILIO PURGOTTI and L. ZANICHELLI (*Gazzetta*, 1904, **34**, i, 57—87. Compare Tanatar, Abstr., 1902, ii, 386 and 495).—Tanatar's equation, $3N_2H_4 = 4NH_3 + N_2$, for the catalytic decomposition of hydrazine sulphate by platinum black is confirmed. It is shown that platinum black, when boiled with water for four hours, quite loses its property of decomposing hydrazine sulphate, although still possessing normal catalytic power with regard to hydrogen peroxide and hydroxylamine; such platinum, after being used to decompose the latter two substances, has not regained its activity towards hydrazine. Platinum black which has been heated in a current of hydrogen is similar, and platinum which has been precipitated by hydrazine or hydroxylamine from a solution of platinic chloride is also inactive as long as it remains suspended in the liquid in which it is formed; on filtering it, however, and drying it in the air, it regains its normal activity. The behaviour of platinum reduced from its chloride by alcoholic potash is similar, but it at once decomposes hydroxylamine and hydrogen peroxide. The authors consider that the catalysis of hydrazine is initiated by traces of oxygen occluded by the platinum; it is noteworthy that the inactive platinum, which can be rendered active by washing it with water and drying in the air, does not become active if kept in water through which air is bubbled for several hours or in which hydrogen peroxide is caused to decompose. The inactive platinum seems not to possess the power of absorbing oxygen whilst covered with water. From the foregoing observations, it is concluded that, contrary to Tanatar's views, the mechanism of the catalysis of hydrazine is totally different from that of the catalysis of hydroxylamine. Platinum which is inactive towards hydrazine sulphate is also inactive to hydrazine hydrate, a fact indicating the same mechanism to exist in both these cases, and again contrary to Tanatar's opinions.

From a study of catalysis of aqueous solutions of hydrazine sulphate, it is concluded that the velocity of decomposition increases nearly proportionately to the increase in the amount of platinum present, and roughly also to the increase of concentration.

The rate of decomposition by platinum of aqueous salts of hydrazine varies greatly with the nature of the acid; the monohydrochloride, sulphate, nitrate, and hydrobromide are most rapidly affected and in the order given, whilst the diacetate, dihydrochloride, and dihydrobromide are much less readily decomposed. It is shown that the addition of traces of acids has a very varying influence on the catalysis; sulphuric, hydrochloric, phosphoric, and boric acids have little effect, but hydrofluoric, hydrobromic, hydriodic, and nearly all organic acids very much retard, if they do not completely inhibit, decomposition. These facts, taken into account with their dissociation, explain the varying nature of the catalysis of hydrazine salts in solution.

W. A. D.

Hydroxamic Acids. Angelo Angeli and Francesco Angelico (*Gazzetta*, 1904, 34, i, 50—57. Compare Abstr., 1902, i, 765; and this vol., ii, 115).—In preparing nitrohydroxylaminic acid from hydroxylamine, ethyl nitrate, and sodium ethoxide, the yield is never greater than 50 per cent. that of theory, owing to part of the ethyl nitrate being decomposed to form nitrous acid and acetaldehyde, the latter then combining with hydroxylamine to form acetaldoxime. The formation of the oxime was ascertained by its distilling with the alcohol used as solvent; it was hydrolysed, and the hydroxylamine formed converted into piperonaldoxime.

The difference between the decomposition of the silver salt and sodium salt of nitrohydroxylaminic acid (compare *loc. cit.*) is discussed; the sodium salt in aqueous solution is resolved into the ions, Na, Na and N_2O_3, and ultimately gives NO_2 and NO. The insoluble silver salt decomposes according to the equations (1) $Ag_2N_2O_3 = AgNO_2 + AgNO$, (2) $AgNO = Ag + NO$; it is shown experimentally that the ratio of silver formed to nitric oxide generated is approximately 1 : 1, as required by equation (2).

The oxidation of sodium nitrohydroxylaminate by potassium permanganate in neutral solution takes place nearly quantitatively according to the equation $Na_2N_2O_3 + 3O = 2NaNO_3$.

Nitrohydroxylaminic acid is the only reagent which satisfactorily differentiates ketones from aldehydes; the hydroxamic acids produced from aldehydes, according to the equation

$$R\cdot CHO + :N\cdot OH = R\cdot C(OH):N\cdot OH,$$

are distinguished by their characteristic behaviour with ferric chloride on copper acetate. As these hydroxamic acids are readily hydrolysed to the corresponding carboxylic acids, the use of nitrohydroxylaminic acid affords a ready means of transforming aldehydes into acids without resorting to destructive processes of oxidation. W. A. D.

Cause of the Conductivity of Air in which Phosphorus is Oxidised. F. HARMS (*Chem. Centr.*, 1904, i, 708; from *Physikal. Zeit.*, 5, 93—95).—The relationship of the number of oxidised oxygen molecules to the number of ions formed by the oxidation of phosphorus in air has been estimated. The latter was determined by measuring the strength of the saturation current, which is readily obtained by employing low oxygen pressures. An *E.M.F.* of 500—1200 volts was used and the progress of the action observed by means of a manometer. From the experimental data, it has been calculated that ions only begin to be formed after eight millions of oxygen molecules have taken part in the action. Ionisation is not, therefore, directly due to the process of oxidation, but depends rather on the formation of ozone by a secondary reaction (compare Richarz and Schenck, this vol., ii, 154). Ionisation does not appear to occur when phosphorus vapour is burnt in oxygen. E. W. W.

Some Physical Constants of Phosphorus Fluorides. HENRI MOISSAN (*Compt. rend.*, 1904, **138**, 789—792).—The fusing points and boiling points of the phosphorus fluorides have been redetermined, using a thermoelectric couple instead of an ordinary thermometer, with the following results: phosphorus trifluoride, PF_3 (compare Abstr., 1885, 15, 482), melts at −160° and boils at −95° under atmospheric pressure; phosphorus pentafluoride, PF_5 (compare Thorpe, Abstr., 1877, 46; Moissan, Abstr., 1886, 303; 1887, 212), prepared by the action of arsenic fluoride on phosphorus pentachloride, forms a white, flocculent solid, melting at −83° to a colourless liquid which does not attack glass and boils at −75°; phosphorus oxyfluoride, PF_3O (compare Abstr., 1886, 767; 1891, 264; and Thorpe and Hamels, Trans., 1889, **55**, 759), forms a white, crystalline solid melting at −68° to a colourless liquid, which does not attack glass, and boils at −40°. M. A. W.

Preparation of Crystalline Silicon and Boron. KARL AUGUST KÜHNE (D.R.-P. 147871).—Powdered oxides or hydroxides of silicon or boron are mixed with aluminium turnings and sulphur and ignited. Thus 400 grams of aluminium, 500 grams of sulphur, and 360 grams of quartz may be mixed and covered with a thin layer of mixed powdered aluminium and sulphur, and ignited by means of a heated iron rod. The mass rapidly fuses, and reaches a white heat. When cold, the aluminium sulphide is decomposed by water, and the silicon remains in the crystalline form. Boron may be prepared from boric acid in similar manner. No external heat is required. C. H. D.

Solubility of Silicon in Zinc and Lead. Henri Moissan and F. Siemens (*Compt. rend.*, 1904, **138**, 657—661).—The metals were heated with excess of silicon in an electric resistance furnace at a constant temperature for about three hours. A pyrometer served to indicate the exact temperature. The following numbers were obtained :

Lead.		Zinc.	
Temperature.	Silicon dissolved in 100 grams.	Temperature.	Silicon dissolved in 100 grams.
1250°	0·024 grams.	600°	0·06 grams.
1330	0·070 ,,	650	0·15 ,,
1400	0·150 ,,	730	0·57 ,,
1450	0·210 ,,	800	0·92 ,,
1500	0·780 ,,	850	1·62 ,,

S. S.

Optical Properties of Vitreous Silica. J. W. Gifford and William A. Shenstone (*Proc. Roy. Soc.*, 1904, **73**, 201—208).—Vitreous silica possesses many properties which render it very valuable for optical work. It is indifferent to most corrosive fumes, it is transparent to ultra-violet radiations, and is not doubly refracting, whilst it is possible to produce two or more identical meltings. The refractive index is low. Measurements were made with prisms manufactured in different ways, one being built up from four separate meltings; the latter, however, was almost indistinguishable from the simple prism. Some of the indices of refraction obtained are given in the following table:

	Wave length.	Index.	Wave length.	Index.
	7950	1·453398	3034·21	1·486881
(*C*)	6563·04	1·4564147	2445·86	1·51096
(*D*)	5893·17	1·4584772	2062·0	1·54271
(*F*)	4861·49	1·463165	1852·2	1·5743

The dispersion is slightly greater than that of quartz. A thin doublet of fluorite achromatised by vitreous silica was examined and found to possess a focal length almost independent of wave length. Thus with a focal length of 1·00000, at wave lengths 7950 and 1852, the greatest variations reached 1·00086 for the *D* line and 0·99054 for wave length 2446. The indices of refraction in the table are probably in almost all cases correct to 1 in the 5th decimal place.

L. M. J.

Preparation of Sodium Oxide. BASLER CHEMISCHE FABRIK (D.R.-P. 148784. Compare Abstr., 1903, ii, 646, 724).—In the preparation of sodium oxide by heating sodium peroxide with metallic sodium, the reaction is greatly facilitated by the addition of a small proportion of sodium hydroxide. A much lower temperature is then required, and, the reaction being very rapid, the vessels employed are less corroded, and a purer product is obtained. The influence of the hydroxide is similar to that of moisture on the reaction between sodium and chlorine. C. H. D.

Action of Carbon Dioxide on Solutions of Sodium Nitrite. CHARLES MARIE and R. MARQUIS (*Compt. rend.*, 1904, **138**, 694—696. Compare this vol., i, 208; ii, 252).—An aqueous solution of β-naphthylamine and sulphanilic acid gives an orange-red colour with even traces of nitrous acid. With the aid of this reagent it is proved that carbon dioxide liberates small amounts of nitrous acid from solutions of sodium nitrite. S. S.

Action of Carbon Dioxide on the Metallo-ammoniums. ÉTIENNE RENGADE (*Compt. rend.*, 1904, **138**, 629—631).—At a temperature between − 60° and − 50°, carbon dioxide reacts with sodium ammonium to form sodium carbamate and hydrogen; the reaction is quantitative and represented by the equation $2CO_2 + 2NH_3Na = 2NH_2{\cdot}CO_2Na + H_2$. At a slightly higher temperature, − 35° to − 25°, the volume of hydrogen liberated is much less than that required by the above equation, and the product consists of a mixture of sodium carbamate and sodium formate, the latter being formed by the action of the nascent hydrogen on carbon dioxide in the presence of sodium ammonium (compare Moissan, Abstr., 1902, i, 255). Similar results were obtained with potassium-ammonium, but as this compound is more stable than the corresponding sodium compound (compare Moissan, Abstr., 1899, ii, 152) the operation could be conducted at a higher temperature, − 10° to − 5°, and a better yield of the formate was thus obtained. M. A. W.

A New Mode of Formation of Calcium Carbide. HENRI MOISSAN (*Compt. rend.*, 1904, **138**, 661—663).—When carbon electrodes are used in the electrolysis of fused calcium chloride, a certain amount of calcium carbide is formed by the union of calcium with the electrodes. The presence of the carbide can be recognised by the formation of acetylene on treating the product of electrolysis with water; the gaseous mixture obtained contains from 11·5—14·6 per cent. of acetylene. The yield of carbide can be improved by adding calcium fluoride and petroleum coke to the electrolytic bath. With these precautions, a product can be obtained which yields a gas containing as much as 65·7 per cent. of acetylene. S. S.

Fluorides, Fluorochlorides, Fluorobromides, and Fluoroiodides of the Alkaline Earth Metals. EDOUARD DEFACQZ (*Ann. Chim. Phys.*, 1904, [viii], 1, 337—362).—A detailed account of the preparation, properties, and method of analysis of the fluorides and double fluorides of calcium, barium, and strontium. The fluoride of calcium and the double fluorides of barium have been already described (compare this vol., ii, 123, 170).

Barium fluoride has not been obtained in a crystalline form owing to its insolubility in manganese chloride, bromide, or iodide.

Strontium fluoride is obtained in the form of octahedral crystals by fusing a mixture of manganese fluoride and strontium iodide.

Calcium and strontium fluorochlorides closely resemble the corresponding barium compound, but they are more readily dissociated by water; they form colourless, transparent crystals; the sp. gr. of the strontium compound is 4·18, that of the calcium 3·07.

Calcium fluorobromide, $CaF_2,CaBr_2$, sp. gr. 3·15, and *strontium fluorobromide*, $SrF_2,SrBr_2$, sp. gr. 4·06, are crystalline compounds, more readily decomposed by water than the barium compound.

Calcium fluoroiodide, CaF_2,CaI_2, has not been obtained pure owing to its deliquescent nature. *Strontium fluoroiodide*, SrF_2,SrI_2, has a sp. gr. 4·5 at 18°. M. A. W.

Decomposition of Carbonates of the Alkaline Earths by Ammonium Chloride in presence of Water. H. Cantoni and G. Goguelia (*Bull. Soc. chim.*, 1904, [iii], 31, 282—287).—When powdered barium carbonate is added to an aqueous solution of ammonium chloride, it is decomposed with the formation of barium chloride and the liberation of ammonia and carbon dioxide. When the mixture is boiled, the reaction proceeds rapidly: thus, a solution containing 197·4 grams of ammonium chloride in 500 c.c. decomposed 9·87 grams of barium carbonate immediately, whilst solutions containing respectively 53·5 and 21·4 grams of ammonium chloride in 500 c.c. decomposed 9·87 grams of barium carbonate in 45 minutes and 16 hours respectively.

At the atmospheric temperature, 5·35, 10, and 20 per cent. solutions of ammonium chloride decomposed respectively 0·919325, 1·255651, and 1·5 grams of barium carbonate in 98 days.

Calcium carbonate is decomposed more slowly by ammonium chloride than is barium carbonate, and the strontium salt more slowly than calcium carbonate. A tabular statement showing the rates at which these salts are decomposed is given in the original. It is suggested that other salts of the alkaline earth metals may be decomposed by ammonium chloride in similar manner.

These results indicate the necessity of avoiding the addition of salts of the alkaline earths in the determination of alkali metals in silicates. T. A. H.

Electrochemical Behaviour of Radium. Alfred Coehn (*Ber.*, 1904, 37, 811—816).—Radium cannot be deposited on a platinum electrode by electrolysis of solutions in alcohol, acetone, or pyridine, as the cathode shows only a temporary induced activity.

With aqueous solutions, cathodes of different metals acquire only a temporary activity in presence of radium bromide solutions; a mercury cathode, however, becomes permanently active, and when extracted with hydrogen bromide gives a permanently active bromide.

The D.P. required for the separation of metal (calculated from heats of formation) increases in the series Ca, Sr, Ba, but proceeds in the reverse direction when amalgams are produced, so that the separation of strontium on mercury requires 0·2 volt more than barium, and calcium 0·25 volt more than strontium; the latter difference is sufficient for the electrolytic separation of these metals.

These values are, however, for saturated solutions, and although the difference between radium and barium should be greater than between barium and strontium, it is not possible to separate these metals except with extraordinarily small current densities; metallic radium is, however, precipitated by barium amalgam. Neither barium nor radium can be separated from aqueous solution on fused Wood's metal.

Metallic radium cannot be satisfactorily deposited on amalgamated platinum, but can be obtained on amalgamated zinc, the upper part of the rod being protected from oxidation by means of paraffin wax.

By precipitation on a pure mercury cathode and dissolution in hydrogen bromide, a considerable increase of activity is obtained in the bromide.

A silver anode was used to absorb the bromine; this at first showed a greater activity than the cathode, but this was due only to induced activity, and disappeared at the end of 24 hours.

The redissolving of the metallic radium in the solution from which it is being deposited can be greatly checked by using methyl alcohol as the solvent in place of water.

Metallic radium in the form of amalgam behaves like its compounds in that the activity increases during several days to a maximum value.

T. M. L.

Atomicity and Atomic Weight of Glucinum. Sebastian M. Tanatar (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 82—86).—In this preliminary communication, the author gives it as his opinion that glucinum is a quadrivalent element of atomic weight 18·2, and that the compounds described by Urbain and Lacombe (Abstr., 1902, i, 132 and 418) as of the type $Be_4O(OR)_6$ have the formula Be_2OR_6 and the constitution $R_3\vdots Be\cdot O\cdot Be\vdots R_3$, for example, $Be(OAc)_3\cdot O\cdot Be(OAc)_3$. The atomic weight 18·2 multiplied by the specific heat at low temperatures (0·3756—0·409) gives 6·8—7·4 for the atomic heat. Attempts to prepare alums containing glucinum and rubidium or cæsium yielded readily soluble double salts which possess neither the composition nor the crystalline form of alums but crystallise in the rhombic and monoclinic systems.

T. H. P.

Magnesium Potassium Carbonate. Friedrich Auerbach (*Zeit. Elektrochem.*, 1904, 10, 161—169).—The solubility of trihydrated magnesium carbonate, $MgCO_3,3H_2O$, in solutions of potassium hydrogen carbonate of various concentrations, up to about 1·1 normal, is determined at 15°, 25°, and 35°. The experiments were arranged so as to prevent loss of carbon dioxide from the solutions. At any one temperature, the solubility of the magnesium carbonate increases as the concentration of the potassium hydrogen carbonate increases, until the point is reached at which the double salt, $MgCO_3,KHCO_3,4H_2O$, begins to be formed; thereafter, the concentration of magnesium carbonate in the saturated solution diminishes. The solubility of magnesium carbonate diminishes as the temperature rises, whilst the solubility product of the double salt increases. From this, it follows that the formation of the double salt from $MgCO_3,3H_2O$ and potassium hydrogen carbonate solution is accompanied by a development of heat, and that the minimum concentration of potassium hydrogen carbonate required for its formation is smaller at lower temperatures than at higher ones. The whole series of conditions under which the existence of the double salt is possible are included in the interval of transition, the upper and lower limits of which are not practically realisable owing to the formation of $MgCO_3,5H_2O$ at low temperatures, and of the double salt, $K_2CO_3,MgCO_3,4H_2O$, at higher ones. T. E.

Lead Tin Alloys. I. Chemical Equilibrium of Lead and Tin in presence of Solutions of their Salts. Otto Sackur (*Chem. Centr.*, 1904, i, 863—864; from *Arb. Kais. Ges.-A.*, 20, 512—544).—Lead is almost completely precipitated from its solution in acetic acid by tin, whilst, on the other hand, tin is precipitated from its solution in nitric acid by lead. In the case of solutions in hydrochloric acid or sulphuric acid, a state of equilibrium between the lead and tin and the salts of these metals is established. The conditions of equilibrium have been determined with varying amounts of free acid, and the results found to agree with a formula deduced from Nernst's theory, and the law of mass action. The behaviour of the metals towards different acids is explained on the assumption that lead has a greater solution tension than tin, and that the stannous salts, with the exception of the nitrate, are only very slightly dissociated into ions. Measurements of the *E.M.F.* of a voltaic element of the form $Pb \mid Pb(NO_3)_2 \mid Sn(NO_3)_2 \mid Sn$ showed that the electrolytic solution tension of lead is about 17·2 times as great as that of tin.

The lead was determined by adding ammonium sulphide to the solution containing lead and tin, dissolving the lead sulphide in a 15 per cent. solution of nitric acid, and precipitating the lead electrolytically. The filtrate from the lead sulphide was treated with sulphuric acid, the sulphide of tin collected, washed with ammonium sulphide, and weighed as dioxide. The electrolytic separation of tin from its solution in ammonium sulphide by Neumann's method was found to be inaccurate, the precipitated metal always containing sulphur. The volumetric estimation of pure stannous salts in acid solution by oxidation with ferric salts and titration with permanganate, or by adding excess of iodine solution and titrating with thiosulphate, gives concordant results only when a considerable excess of the oxidising agent is used. The presence of lead causes errors in the permanganate method, but lead salts do not affect the iodine method; in the latter, sodium or potassium acetate should be used to dissolve iodide of lead, and not ammonium acetate. E. W. W.

Lead Carbonate. Roberto Salvadori (*Gazzetta*, 1904, 34, i, 87—92).—Ammonium carbonate precipitates from a cold solution of lead nitrate the normal carbonate, $PbCO_3$, but when this is boiled with water for some time, carbon dioxide is evolved and the basic carbonate, $2PbCO_3,Pb(OH)_2$, formed. The same product is obtained on boiling the normal carbonate with *N*/100, *N*/20, and *N*/10 aqueous solutions of sodium sulphate or sodium chloride, and on boiling lead chloride or lead sulphate with an equivalent quantity of aqueous sodium carbonate. On adding to a mixture of lead sulphate and carbonate a solution containing sodium sulphate and carbonate, the whole of the sodium carbonate is converted into sodium sulphate when the latter is present in large excess, lead carbonate being formed. Similarly, when lead nitrate is added to a solution containing both sodium sulphate and carbonate, lead carbonate only is precipitated, contrary to Findlay's theory of fractional precipitation (Abstr., 1900, ii, 716); the whole of the sodium carbonate is precipitated before any lead sulphate is formed. W. A. D.

Halogen Compounds of Mercury. Miles S. Sherrill (*Zeit. physikal. Chem.*, 1904, 47, 103—106. Compare Abstr., 1903, ii, 534, 649).—When allowance is made for the dissociation $HgX_2 \rightleftharpoons HgX^{\cdot} + X'$, where $X = Cl$, Br, or I, the calculations made in the author's previous papers must be somewhat modified. J. C. P.

Hydrolysis of Mercuric Chloride. Robert Luther (*Zeit. physikal. Chem.*, 1904, 47, 107—112. Compare Morse, Abstr., 1903, ii, 12; Sherrill, Abstr., 1903, ii, 534, 649; preceding abstract).—According to Ley (Abstr., 1900, ii, 67), the conductivity of a mercuric chloride solution is due to the hydrochloric acid formed by hydrolysis, but the author shows that in solutions of medium concentration this is not entirely the case. The variation of the conductivity of mercuric chloride solutions with dilution is well represented by the formula $\chi v^{2/5} = \text{const.}$, as is shown by comparison with the actual measurements of Ley (*loc. cit.*) and Kahlenberg (Abstr., 1901, ii, 540). When Morse's results also are taken into account, it is probable that the hydrolysis of mercuric chloride in aqueous solution takes place according to the equation: $2HgCl^{\cdot} + H_2O = (HgCl)_2O + 2H^{\cdot}$. The concentrations (in mols. per litre) of the various components of a saturated aqueous solution of mercuric chloride at 25° are estimated as follows: $HgCl_2, 2{\cdot}6 \times 10^{-1}$; $H^{\cdot}, 3{\cdot}3 \times 10^{-4}$; $(HgCl)_2O, 1{\cdot}7 \times 10^{-4}$; $Cl', 4{\cdot}8 \times 10^{-4}$; $HgCl^{\cdot}, 1{\cdot}5 \times 10^{-4}$; $Hg^{\cdot\cdot}, 1 \times 10^{-8}$; $HgCl_4'', 5 \times 10^{-6}$. J. C. P.

Action of Copper on Chloric Acid with and without Electrolysis. André Brochet (*Bull. Soc. chim.*, 1904, [iii], 31, 287—290. Compare Abstr., 1903, ii, 210 and 352; and this vol., ii, 249).—Copper is violently attacked by a concentrated solution (280 grams per litre) of chloric acid at 60—80°, and is rapidly dissolved even at the ordinary temperature, but is only slowly dissolved by the normal acid (83·5 grams per litre). In no case is any hydrogen evolved.

When a normal solution of chloric acid is electrolysed in the cold, using a copper anode, the latter is attacked regularly over its whole surface and becomes coated with a layer of cuprous chloride which, however, disappears on warming. Similarly, when copper is dissolved in a cold normal solution of chloric acid, the metal becomes covered with a layer of hydrated cuprous oxide. It appears, therefore, that the metal passes into solution in the cuprous form, the cuprous compound first produced being dissolved, if there is an excess of chloric acid present, forming cupric chloride and chlorate. With the concentrated acid, the reaction is complicated by the formation of oxygenated compounds of chlorine, and in the absence of an excess of free chloric acid, complex basic salts are precipitated. T. A. H.

Formation of Basic Copper Salts under the Influence of Electrolysis. André Brochet (*Bull. Soc. chim.*, 1904, [iii], 31, 290—293. Compare preceding abstract).—When metallic copper is placed in a solution of copper chlorate, the metal becomes coated with a layer of hydrated cuprous oxide and cupric chloride appears in the solution. Ultimately a pale blue precipitate having the composition represented by the general formula $Cu(X)_2,3Cu(OH)_2$ is produced, in which X is a mixture of the radicles Cl and ClO_3, the former predominating. It is suggested that this precipitate is formed by the oxidation, at the expense of the copper chlorate, of the cuprous oxide to cupric oxide, which then combines with the cupric chloride and chlorate in the solution.

When a solution of copper chlorate is electrolysed (compare this vol., ii, 249), using a copper anode, the latter is attacked irregularly and is eventually converted into a lace-like mass of filaments; the negative pole becomes coated with a non-coherent layer of copper containing some chloride, and there is formed a pale blue precipitate of a complex basic salt, conforming to the general formula already given, but in which X is principally represented by the radicle ClO_3. It is suggested that this compound is formed in the manner already indicated, and that this reaction affords an explanation of the observed fact that the ratio between the amount of copper dissolved and that deposited in the voltameter under these conditions varies from 1·5 to 2 according to the conditions of the experiment. T. A. H.

Basic Cupric Chlorate. André Brochet (*Bull. Soc. chim.*, 1904, [iii], 31, 293).—The basic cupric chlorate, $Cu(ClO_3)_2,3Cu(OH)_2$, described by Bourgeois (Abstr., 1899, ii, 157), has been obtained in a slightly impure amorphous form by adding to cold aqueous solutions of cupric chlorate, cupric hydroxide or hydroxides of the alkalis or alkaline earths. The product obtained invariably contained an excess of cupric hydroxide and a quantity of water, which was not lost by exposure under reduced pressure or by heating at 100°. T. A. H.

Complex Copper Compounds. Volkmar Kohlschütter (*Ber.*, 1904, 37, 1153—1171. Compare Abstr., 1903, i, 468).—[With P. Pudschies.]—When any cupric salt is dissolved in concentrated ammonia and rather more than an equivalent quantity of potassium thiocyanate is added, dark blue, rhombic tablets of the salt,

$$[Cu(NH_3)_4](CSN)_2,$$

separate. This dissolves in water to a violet solution, from which potassium thiocyanate precipitates bright blue, insoluble needles of the compound $[Cu(NH_3)_2](CSN)_2$. Other alkali salts do not produce this precipitate, but it is obtained whenever the concentration of ammonia in the solution is diminished by dilution, warming, or exposure to air. On adding potassium iodide to a solution of cuprammonium iodide, $[Cu(NH_3)_4]I_2,H_2O$, the colour changes gradually from violet to green, and large, almost black crystals of the compound $Cu_3(NH_3)_{10}I_6$ separate. This is probably identical with a salt obtained by Richards and Oenslager (Abstr., 1895, i, 330), and is to be regarded as a double compound, $2[CuI(NH_3)_3]I,[Cu(NH_3)_4]I_2$. Potassium oxalate precipitates blue crystals of the salt $Cu(NH_3)_4I_2(C_2O_4),6H_2O$.

Cuprammonium oxalate, $Cu(NH_3)_2C_2O_4,2H_2O$, is precipitated in the form of vitreous, blue prisms, often forming crossed twins, from a solution of cuprammonium sulphate, $[Cu(NH_3)_4]SO_4$, by potassium oxalate, even in presence of a considerable excess of ammonia.

Cuprammonium bromide, $Cu_3(NH_3)_{10}Br_6$, is only obtained on warming. Potassium bromide precipitates bluish-green crystals of a basic salt, $Cu(NH_3)_2Br_2,2CuO,3H_2O$, from its solution.

Experiments on the electrolytic transport of aqueous solutions of cupric chloride lead to the conclusion that the cathion in such solutions is a complex containing water molecules, and that the equilibrium, $[CuCl(H_2O)_3]^{\cdot} + H_2O \rightleftarrows [Cu(H_2O)_4]^{\cdot\cdot} + Cl'$, is displaced by a rise of temperature in the direction of the lower arrow. A few experiments with solutions of cupric chloride in acetone are also described.

C. H. D.

Absorption of Oxygen by Alkaline Cerous Solutions. Emil Baur (*Ber.*, 1904, 37, 795—798).—The absorption of oxygen by alkaline cerous solutions is greatly influenced by the degree of alkalinity and by the character of the cerium salt. Three specimens, *A* nitrate, *B* and *C* chloride, gave the following absorptions in percentages of peroxide salt formed: *A*, 55, 48, 56, 54·2, 55; *B*, 52·3, 44·2, 37·2, 51·2, 52·3, 55, 44, 52·3; *C*, 72·1, 62·1, 72·0. Specimen *B*, which gave about 50 per cent. absorption in presence of potassium carbonate, gave 60·1, 75·9, 67·8, 59·3, 76·3 and 62·8 per cent. when the carbonate was partially converted into hydrogen carbonate, whilst when sodium hydroxide was added to the carbonate the absorption of oxygen was scarcely greater than that required to convert the cerous into a ceric salt.

T. M. L.

Adsorption Compound formed by Iodine with Basic Lanthanum Acetate. Wilhelm Biltz (*Ber.*, 1904, 37, 719—724).—The author has determined the amount of iodine removed from its solution in potassium iodide by known quantities of the gelatinous precipitate formed by adding ammonia to a solution of lanthanum acetate. It varies largely according to the physical state of the precipitate, the amount of iodine absorbed being greatest in the case of the flocculent, semi-transparent colloidal mass obtained by Damour's method (*Compt. rend.*, 1857, 43, 976), a deep blue colour being produced; when the precipitate is formed in boiling solution, it is granular and absorbs little iodine, a brownish-black colour being the result. Approximately the same proportion of the total amount of iodine is removed by a fixed quantity of the same precipitate from solutions containing varying amounts of iodine. Thus, with solutions containing from 1·88—0·105 grams of iodine, the ratio of iodine remaining unabsorbed to iodine absorbed varied only from 7·2—8·3. Another preparation gave values varying from 9—12 for the same ratio. These results are similar to those obtained by Küster (Abstr., 1895, i, 199) in the case of iodine and starch; it may be concluded that the blue colour produced by iodine with lanthanum acetate does not correspond with the formation of a definite compound. The analogy with starch is made complete by the fact that a colloidal solution of basic lanthanum acetate, prepared by dialysis, absorbs iodine according to the same law. W. A. D.

Europium. Georges Urbain and Henri Lacombe (*Compt. rend.*, 1904, 138, 627—629).—From 610 grams of the mixed oxides of samarium, europium, and gadolinium obtained from 500 kilos. of monazite sand, the authors have separated, by a method already described (compare this vol., ii, 37, 173), six fractions consisting of the pure europium salt, representing 2 parts of europium oxide in 100,000 parts of the mineral. No differences could be detected in any of these fractions, so that if europium is a mixture, its components cannot be separated by fractionation of the double magnesium salts. *Europium sulphate*, $Eu_2(SO_4)_3,8H_2O$, is obtained in well-formed crystals having a rose colour, is unaltered in air, is dehydrated at 375°, and converted into the oxide at 1600°; the oxide thus obtained has a rose colour, whilst that prepared at a lower temperature by calcining the oxalate is white with a faint rose tint in mass.

The atomic weight of europium, as determined (1) by the conversion of the hydrated sulphate into the anhydrous salt, (2) by the conversion of the anhydrous sulphate into the oxide, (3) by the conversion of the hydrated sulphate into the oxide (5 determinations in each case), is 151·79, with an error of not more than 0·06 (compare Demarçay, Abstr., 1900, ii, 481; 1901, ii, 511). M. A. W.

General Method of Preparing Anhydrous Chlorides. Camille Matignon and F. Bourion (*Compt. rend.*, 1904, 138, 631—633. Compare Abstr., 1901, ii, 602; 1902, ii, 263, 505).—A mixture of chlorine and sulphur chloride (S_2Cl_2) is a convenient agent for preparing the anhydrous metallic chlorides from the corresponding oxide, in that it possesses both chlorinating and reducing properties and reacts at a comparatively low temperature. By passing a stream of chlorine saturated with sulphur chloride over the heated oxide, the following compounds were obtained: (1) silicon tetrachloride, $SiCl_4$, boiling at 59°, from silica heated to a dull redness. (2) A double chloride of aluminium and sulphur, Al_2Cl_6,SCl_4, a yellow oil which solidifies on cooling; prepared from alumina heated at 350° to 400°. (3) Thorium tetrachloride, $ThCl_4$, beautiful, prismatic needles 1—2 cm. long; prepared from thoria heated to low redness. (4) The chlorides of praseodymium, neodymium, and samarium, from the corresponding oxides or carbonates; in this case, the heating has to be gradual to avoid fusing the mixture of chloride and oxychloride first formed. (5) Vanadium tetrachloride, VCl_4, boiling at 150° with partial decomposition into chlorine, and the sesquichloride, V_2Cl_6. The chlorinating mixture attacks vanadium oxide in the cold, with the formation of the oxychloride, $VOCl_3$, boiling at 126°. This is, however, converted into the tetrachloride by mixing with excess of sulphur chloride and heating to dull redness. M. A. W.

Transformation of Oxides and Oxygenated Salts into Chlorides. Camille Matignon and F. Bourion (*Compt. rend.*, 1904, 138, 760—762. Compare preceding abstract).—By means of a mixture of chlorine and sulphur chloride, oxides and oxygenated salts are converted into anhydrous chlorides; the reaction in some cases proceeds quantitatively and is suitable for analytical purposes. Tungsten trioxide, when strongly heated with the chlorinating mixture, gives the oxychloride, WO_2Cl_2, in brilliant, yellow plates subliming at 264° without previous fusion; at a lower temperature, the oxychloride, $WOCl_4$, is formed in slender, red needles which melt at 211° [compare, however, Smith and Flack, Abstr., 1900, ii, 81]. Chromium sesquioxide and ferric oxide are rapidly and completely converted into the corresponding anhydrous chlorides when heated below redness in a mixture of chlorine and sulphur chloride; nickel and cobalt oxides are similarly chlorinated at 400°, the reaction being accompanied by incandescence; zinc, manganese, and tin oxides are also converted into the corresponding anhydrous chlorides when heated below fusion in the chlorinating mixture. Boron trioxide has not been converted into the chloride by the action of chlorine and sulphur chloride. Barium and calcium sulphates and barium carbonate are converted quantitatively into their respective chlorides when heated with the chlorinating mixture, and the method has been applied to the analysis of mixtures of iron oxide and barium sulphate, and chromium sesquioxide and barium sulphate, the resulting mixed chlorides being separated by sublimation in the first case and by solution in the second. M. A. W.

Electrolytic Preparation of Aluminium. Gustave Gin (D.R.-P. 148627).—A mixture of sodium aluminium fluoride and sodium thioaluminate, prepared by fusing together aluminium fluoride and sodium sulphide: $2Al_2F_6 + 6Na_2S = Al_2F_6,6NaF + Al_2S_3,3Na_2S$, may be electrolysed in the fused state. The thioaluminate is decomposed by the current: $Al_2S_3,3Na_2S = 3Na_2S + 2Al + 3S$, and the sodium sulphide then reacts with the double fluoride: $Al_2F_6,6NaF + 3Na_2S = 12NaF + 2Al + 3S$. Bauxite is used, and is dissolved in hydrofluoric acid; precipitated alumina or bauxite is then added to remove iron, silicon, and titanium. The process is cyclic, the sulphur produced being burnt to sulphuric acid, which is then used to prepare the hydrofluoric acid from the sodium fluoride formed in the electrolysis. The sodium sulphate thus produced is heated with coal to regenerate sodium sulphide. C. H. D.

Estimation of Sulphuric Acid. Richard Silberberger (*Monatsh.*, 1904, 25, 220—248. Compare Abstr., 1903, ii, 751).—The estimation of sulphuric acid by precipitation as barium sulphate is known to give inaccurate results in presence of iron, chromium, aluminium, or potassium salts. The object of the investigation was to determine the nature of the compounds retained by the barium sulphate.

Aluminosulphuric acid, $Al_2(SO_4H)_6,7H_2O$, is prepared by adding aluminium sulphate to cold concentrated sulphuric acid and warming, when a voluminous white precipitate separates. On diluting with ether, filtering, and washing with ether, the acid is obtained as a white powder, decomposing in moist air and dissolving in water, the solution soon decomposing into aluminium sulphate and sulphuric acid.

No definite product could be obtained from chromic sulphate or ferric sulphate and sulphuric acid in similar manner, although several chromosulphuric acids have been isolated by Recoura (Abstr., 1893, ii, 470). The addition of barium chloride to solutions of aluminium or chromic sulphate in concentrated sulphuric acid also yielded products to which no formula could be assigned; they contain barium sulphate arising from the decomposition of the complex salt originally formed.

The barium ferrisulphate described by Küster and Thiel (Abstr., 1900, ii, 242) is probably $Ba_3Fe_2(SO_4)_6$, from its decomposition into barium sulphate, ferric oxide, and sulphur trioxide on ignition (Jannasch and Richards, Abstr., 1889, 926).

On adding barium nitrate to a concentrated solution of potassium sulphate and potassium nitrate, a white, unstable *salt* is precipitated, which, after drying over sulphuric acid, has the composition $NO_3\cdot Ba\cdot SO_4\cdot Ba\cdot SO_4K$. Boiling dilute hydrochloric acid only removes a portion of the alkali. The *salt* obtained from barium chloride, potassium sulphate, and potassium chloride has the composition $Cl\cdot Ba\cdot SO_4\cdot Ba\cdot SO_4\cdot Ba\cdot SO_4K$. Sodium salts are not retained by barium sulphate in the form of complex salts. Platinum salts are also not retained.

The remainder of the paper contains an account of the author's method of precipitation of sulphates with strontium chloride in alcoholic solution (*loc. cit.*). C. H. D.

Atomic Weight of Indium. Louis M. Dennis and William C. Geer (*Ber.*, 1904, 37, 961—962. Compare Thiel, this vol., ii, 177).—An alcoholic solution of anhydrous indium chloride gives a heavy, colourless precipitate with pyridine, which only redissolves in a large excess of pyridine; indium chloride can in this manner be completely separated from iron and aluminium chlorides. A method based on this is being used to purify indium for atomic weight determinations. Metallic indium can be deposited electrolytically from solutions of its chloride or nitrate in either pyridine, hydroxylamine, or formic acid.

Indium nitrate forms a double salt with ammonium nitrate, which crystallises in large, colourless prisms. E. F. A.

Preparation of Metallic Silicides; Manganese Silicides. Paul Lebeau (*Ann. Chim. Phys.*, 1904, [viii], 1, 553—574).—A detailed account of the preparation and properties of the manganese silicides, $SiMn_2$, SiMn, and Si_2Mn (compare Abstr., 1903, ii, 215, 298, 652). The silicide, $SiMn_2$, has the sp. gr. 6·40 at 15°, and not 6·20 as stated in the earlier paper. M. A. W.

Formation of Magnetite by Heating Iron in Carbon Dioxide. Julius Donau (*Monatsh.*, 1904, 25, 181—187. Compare Baur and Glaessner, Abstr., 1903, ii, 423).—According to Tissandier (this Journal, 1872, 284), iron is converted into ferrous oxide by heating at 900° in a current of dry carbon dioxide.

Experiments in which pure iron wire was heated at 1200° in a current of dry carbon dioxide showed that the product is ferrosoferric oxide, which resembles natural magnetite in appearance, crystalline form, density, hardness, &c. The product is magnetic, and the crystals often show magnetic polarity, especially when the heating has been carried out in an electric furnace. The presence of moisture in the carbon dioxide has no influence on the result, except that the formation of large crystals is facilitated. C. H. D.

Variable Hydrolytic Equilibrium of Dissolved Chromium Sulphate. Theodore W. Richards and Frederic Bonnet (*Zeit. physikal. Chem.*, 1904, 47, 29—51).—When a violet solution of chromium sulphate is subjected to dialysis, examination of the salt that has diffused and of the salt that has remained in the dialyser shows that the ratio Cr/SO_4 is the same in both. When, however, a green solution of chromium is similarly treated, the ratio Cr/SO_4 diminishes in the diffused portion and increases in the dialyser—an observation in favour of the view that the change from violet to green involves a hydrolysis with formation of free acid and a soluble basic salt. The extent of the hydrolysis was estimated by comparing the influence of the green solution on the rate of inversion of sugar with that of a hydrochloric acid solution of known strength. The acid produced by hydrolysis at 100° in a $\frac{1}{4}$-molar solution of chromium sulphate is about $0·13N$; that produced by hydrolysis at 50° is about $0·1N$. These values are, if anything, too low, since a green solution reverts slowly to the violet condition at the ordinary temperature. The violet solution itself inverts sugar very slowly, but if a violet solution and a green solution (both $\frac{1}{4}$-molar) are kept for about a month at 30°, the amount of acid present (as indicated by the sugar inversion method) becomes the same in the two cases (about $0·043N$). Thus the hydrolytic equilibrium between the violet and the green salts varies with the temperature.

When the violet solution is boiled, cooled, and immediately extracted with a mixture of alcohol and ether, the acid is removed, and it is thus possible to get the ratio Cr/SO_4 in the residual green solution as high as 1/1. If the acid is removed by digesting at 100° with chromic hydroxide, the same final value of the ratio is obtained, but if the violet solution is saturated with the hydroxide at 20°, it becomes green, and the ratio Cr/SO_4 assumes finally the value 5/4.

When barium sulphate is precipitated from a green solution of chromium sulphate, it carries down with it small quantities of a green, strongly basic chromium sulphate, the amount of this depending on the extent to which hydrolysis has taken place. If the precipitation takes place in a violet solution, scarcely any chromium is carried down with the barium sulphate (compare Richards, Abstr., 1900, ii, 472; Richards, McCaffrey, and Bisbee, Abstr., 1901, ii, 624).

Electrolytic experiments showed that there is no complex chromium anion in the green solutions of the sulphate.

The work detailed in the paper points to the existence of a green basic salt, in which at least 47 per cent. of the acid radicle is replaced by hydroxyl. It is not possible to give a definite formula to this basic salt, and there may exist several compounds hydrolysed to different degrees. J. C. P.

Barium and Lead Uranyl Acetates and the Corresponding Uranates. JOSEF ZEHENTER (*Monatsh.*, 1904, 25, 197—219. Compare Abstr., 1900, i, 424).—Barium uranyl acetate,

$$Ba(C_2H_3O_2)_2,2UO_2(C_2H_3O_2)_2,3H_2O,$$

prepared by concentrating an acid solution of the mixed acetates in a vacuum, loses $3H_2O$ at 200°, and is decomposed, yielding barium diuranate, BaU_2O_7, between 300° and a red heat. On boiling the acetate with water, a yellow, crystalline mass of *barium triuranate*, $BaU_3O_{10},4\frac{1}{2}H_2O$, is obtained, which loses $2\frac{1}{2}H_2O$ at 140°, and the remaining $2H_2O$ at low redness. On heating a solution of the acetate on the water-bath and continually replacing the water evaporated, the whole of the uranium is precipitated in the form of *barium pentauranate*, $Ba_2U_5O_{17},8H_2O$, which forms golden-yellow crystals; these lose $4\frac{1}{2}H_2O$ at 140°, and the remaining water of crystallisation at low redness. If the solution contains an excess of barium acetate, barium diuranate is precipitated. When a 1 per cent. solution of barium uranyl acetate is boiled for 4—5 hours in a reflux apparatus, yellow, microscopic, hexagonal leaflets of *barium heptauranate*, $Ba_2U_7O_{23},11H_2O$, separate. This salt loses $2\frac{1}{2}H_2O$ at 110°, and the remaining $8\frac{1}{2}H_2O$ at low redness.

A solution of barium and uranyl acetates, kept in a closed flask in diffused daylight or in darkness, slowly deposits small, prismatic crystals of a *salt*, $BaU_3C_4H_{10}O_{15},6\frac{1}{2}H_2O$, which loses $6\frac{1}{2}H_2O$ in a vacuum, and a further $2H_2O$ is evolved on heating to 250°. The compound is probably to be regarded as $Ba(C_2H_3O_2)_2,3UO_3,2H_2O$. Acetone is evolved on ignition, and barium triuranate remains.

Solutions of lead and uranyl acetates, evaporated in a vacuum, deposit silky, yellow needles of lead uranyl acetate,

$$Pb(C_2H_3O_2)_2,UO_2(C_2H_3O_2)_2,3H_2O,$$

becoming anhydrous in a vacuum-desiccator. Lead uranate, $PbUO_4$, remains on ignition as a reddish-brown, crystalline mass. When a dilute solution of the double salt is boiled in a reflux apparatus, golden-yellow crystals of lead diuranate, $PbU_2O_7,2\frac{1}{2}H_2O$, separate, becoming anhydrous on ignition. A less dilute solution deposits a reddish-yellow precipitate of *lead enneuranate*, $Pb_5U_9O_{32},10H_2O$, becoming anhydrous on ignition. Slow evaporation in an open dish on the water-bath causes the deposition of yellow crystals of *lead pentauranate*, $Pb_4U_5O_{19},4H_2O$, becoming anhydrous on ignition. At temperatures below 5°, prismatic crystals of the *salt*,

$$[Pb(C_2H_3O_2)_2,3UO_3,2H_2O]3H_2O,$$

corresponding with the barium salt, are deposited. $3H_2O$ are evolved in a vacuum, and *lead triuranate*, PbU_3O_{10}, remains on ignition.

The results concerning water of crystallisation differ in some respects from those obtained by Wertheim (1843) and Rammelsberg (Abstr., 1885, 648). The types of salts obtained in the present and former paper (*loc. cit.*) are presented in tabular form. C. H. D.

Zirconium Tetraiodide, ZrI_4. ARTHUR STÄHLER and BRUNO DENK (*Ber.*, 1904, **37**, 1135—1139).—Zirconium tetraiodide has been described by Dennis and Spencer (Abstr., 1897, ii, 558) as a white, crystalline powder, not acted on by water or acids. The authors have re-investigated this compound, and obtain quite different results:

Zirconium tetraiodide is best prepared by heating metallic zirconium or the carbide, prepared by Moissan's method (Abstr., 1896, ii, 428), in a current of dry hydrogen iodide. A vigorous reaction sets in at 340° in the case of the metal, or at 490° in the case of the carbide, and a brown sublimate is formed. After removal of hydrogen iodide by hydrogen, the sublimate is digested with benzene at 100° in a sealed tube to remove free iodine. It is then filtered in an atmosphere of hydrogen, washed with benzene, and dried. The tetraiodide is a yellow, micro-crystalline powder, which fumes in air and dissolves in water or acids with a vigorous reaction. Alcohol also dissolves it, forming ethyl iodide and zirconic acid. Dry ether dissolves it to a yellow solution, first forming an additive product. Ammonia, propylamine, &c., also yield additive products with an ethereal solution of the tetraiodide, which will be further investigated.

For analysis, the iodide is dissolved under ether in water containing a little sulphurous acid. The zirconium is then precipitated by ammonia, and the iodine is determined in the filtrate as silver iodide.

A definite oxyiodide of zirconium has not yet been obtained (compare Venable and Baskerville, Abstr., 1898, ii, 596). By dissolving the tetraiodide in water, or by dissolving zirconium hydroxide in hydriodic acid, and evaporating, colourless, hygroscopic needles of the composition $ZrOI_2,8H_2O$ are obtained, dissolving readily in water or alcohol. The composition corresponds with that of the known oxychloride and oxybromide. C. H. D.

So-called Explosive Antimony. ERNST COHEN and WILHELM E. RINGER (*Zeit. physikal. Chem.*, 1904, **47**, 1—28).—Explosive antimony has been prepared by electrolysing solutions of antimony trichloride containing free hydrochloric acid, and the authors have studied the variation of its composition with current density, with temperature, and with the concentration of the trichloride solution. Explosive antimony contains some trichloride, and extraction experiments, in which the powdered explosive product was treated with a mixture of alcohol and ether, showed that the enclosed trichloride is not held mechanically. It may, however, be driven out by heat, and may then be dissolved in the alcohol-ether mixture, the process actually employed in the analysis of the explosive antimony. The percentage of antimony trichloride in this substance is independent of the amount of hydrochloric acid in the electrolysed solution, but is slightly diminished by an increase of current density. As the concentration of the trichloride in the electrolysed solution increases from 3·1 to 85·7 per cent., the percentage of trichloride in the explosive product increases from 1·64 to 10·5 per cent. The curve obtained by plotting the one percentage of trichloride against the other is discontinuous about the point corresponding with 10 per cent. of trichloride in solution, and it is significant that the metallic product obtained from solutions containing less than 10 per cent. of trichloride is not explosive. As the temperature of the electrolysed solution is raised, the percentage of antimony trichloride in the metallic product diminishes. J. C. P.

Alloys of Copper and Antimony and the Phenomenon of Recalescence observed in them. A. A. Baikoff (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 111—165).—The author has prepared melting point curves and tables of alloys of copper and antimony, and also their cooling curves. The latter show that these alloys exhibit the phenomenon of recalescence.

Copper and antimony form two compounds, $SbCu_2$ and $SbCu_3$. The former has a bright violet colour, whilst the second is white with a perceptible green tint. All alloys containing less than 51 per cent. of copper (corresponding with $SbCu_2$) have also a violet colour, which becomes fainter as the proportion of copper diminishes. The characteristic yellow colour of copper is only found in the alloys containing more than 70 per cent. of copper. The violet alloy, $SbCu_2$, melts and decomposes at 586°, and can be prepared by melting $SbCu_3$ and antimony together in such proportions that solidification begins at a temperature below 586°; mixtures of the two metals, which commence to solidify at higher temperatures than 586°, deposit only the alloy $SbCu_3$, which melts at 681°. These results are in accord with those given by a study of the other physical properties of these alloys, hardness, expansion, and *E.M.F.* in galvanic elements.

The alloy $SbCu_3$ exists in two modifications: (1) the α-form, stable at temperatures below 407°, and (2) the β-form, stable at higher temperatures. All mixtures of the two metals containing from 53·5 to 61 per cent. of copper, and consisting of mixed crystals of antimony and the compound $SbCu_3$, undergo, on cooling, two distinct changes: (1) polymorphic transformation of the β-form of $SbCu_3$ into the α-modification, and (2) separation of $SbCu_2$.

The micro-structure of the different alloys confirms the above conclusions. T. H. P.

Structure of Fluorovanadium Compounds. Petr G. Melikoff and Paul Kazanezky (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 77—82).—On the basis of their previous researches (Abstr., 1902, ii, 27), and of an examination of the compounds of vanadium oxyfluoride with potassium and ammonium fluorides, $VO_2F,2KF$ and VO_2F,NH_4F, the authors conclude that these compounds are potassium and ammonium salts of orthovanadic acid, in which one atom of oxygen is replaced by two atoms of fluorine and a hydroxyl group also replaced by one atom of fluorine; the compounds hence have the structures: $VF_3(OK)_2$ and $NH_4F\cdot F\cdot VF_2(ONH_4)_2$. T. H. P.

Mineralogical Chemistry.

Cryolithionite, a New Mineral. N. V. Ussing (*Overs. K. Danske Videnskab. Selsk. Forhandl.*, 1904, 3—12).—The new mineral occurs as large, colourless, rhombic dodecahedra in the cryolite of Ivigtut, Greenland. There is a good cleavage parallel to the faces of the rhombic dodecahedron, H. 2½—3; sp. gr. 2·77; refractive index 1·3395(Na). The crystals contain cryolite and liquid enclosures. Analysis by Chr. Christensen of pure material gives the formula $Li_3Na_3Al_2F_{12}$. The mineral dissolves in 1350 parts of water at 18°, and from this solution crystallises as cubes. It fuses at about 710°, and on cooling crystallises in rectangular, arborescent forms.

Al.	Na.	Li.	F.	Loss on ignition.	Total.
14·46	18·83	5·35	60·79	0·36	99·79

Although the mineral has certain points in common with cryolite (Na_3AlF_6), it is crystallographically more closely related to the garnet ($Ca_3Si_3Al_2O_{12}$) and sodalite groups.

Cryolithionite contains the highest percentage of lithium of any mineral yet known. L. J. S.

[Tellurium and Tellurite from Colorado; Cuprodescloizite from Arizona.] William P. Headden (*Proc. Colorado Sci. Soc.*, 1903, 7, 141—150).—Analysis of pure cleavage fragments of native tellurium from the Goodhope mine, Gunnison Co., Colorado, gave: Te, 99·45; Fe, 0·11; Se, 0·40 = 99·96. Several analyses are also given of impure material, from the same locality and from Boulder Co., consisting of native tellurium intermixed with various tellurides, pyrites, quartz, &c.; some of these are fine grained and without recognisable cleavage.

Tellurite (TeO_2) occurs at the Goodhope mine as a white coating on the native tellurium, and also as brownish-yellow, granular masses of small crystals, which are perhaps tetragonal; analysis of the latter gave:

Te.	Bi_2O_3.	Fe_2O_3.	Insol.	O.	Total.
78·68	trace	0·70	1·04	[19·58]	100·00

Chestnut-brown, fibrous cuprodescloizite ($R_3V_2O_8,R[OH]_2$) from Nogales, Arizona, gave:

V_2O_5.	As_2O_5.	PbO.	CuO.	ZnO.	Fe_2O_3.	MnO.	H_2O.	Insol.	Total.
19·014	3·842	52·954	8·506	12·45	0·20	trace	2·65	0·35	99·996

L. J. S.

Some Californian Minerals. Waldemar T. Schaller (*Amer. J. Sci.*, 1904, [iv], 17, 191—194).—*Halloysite.*—A pink clay occurring in large seams at the lepidolite mine near Pala, San Diego Co., is shown by analysis I to be halloysite ($H_4Al_2Si_2O_9,H_2O$). Other pink clays from the United States have proved to be montmorillonite and cimolite.

	SiO_2.	Al_2O_3.	Fe_2O_3.	MnO.	CaO.	MgO.	Li_2O.	Na_2O.	K_2O.	H_2O (107°).	H_2O. (>107°).	TiO_2.	Total.
I.	43·62	35·55	0·21	0·26	1·02	0·19	0·23	0·19	0·03	6·63	12·25	Nil.	100·18

Amblygonite.—A large deposit of massive, white amblygonite occurs at the lepidolite mine near Pala; analysis II:

	P_2O_5.	Al_2O_3.	Fe_2O_3.	MnO.	MgO.	Li_2O.	Na_2O.	H_2O.	F.	TiO_2.	Total (less O for F).
II.	48·83	33·70	0·12	0·09	0·31	9·88	0·14	5·95	2·29	Nil.	100·35

Boothite.—A massive, pale blue copper sulphate, sp. gr. 1·944, from the copper mine near Campo Seco, Calaveras Co., gave results (III) proving it to be boothite ($CuSO_4,H_2O,6H_2O$). A redetermination of the sp. gr. of purer material from the original locality (Abstr., 1903, ii, 490) gave 1·935:

	CuO.	FeO.	MgO.	SO_3.	H_2O(110°).	H_2O(>110°).	Insol.	Total.
III.	26·13	0·81	0·64	27·25	36·76	4·91	3·96	100·46
IV.	7·56	15·85	—	30·74	45·85		[About 6 p.c. deducted.]	100·00

Pisanite.—Analysis of a massive specimen from Gonzales, Monterey Co., gave results (IV) agreeing approximately with the formula $CuO,2FeO,3SO_3,21H_2O$. Previously published analyses of pisanite show no definite ratio of copper to iron, and the formula of the mineral is therefore written as $(Cu,Fe)SO_4,7H_2O$, representing an isomorphous mixture of melanterite and boothite.

Quartz Pseudomorphous after Apophyllite.—Some small crystals from Fort Point, San Francisco, with the form and angles of apophyllite, gave, on analysis, the results under V:

	SiO_2.	Al_2O_3.	CaO.	MgO.	H_2O.	Total.
V.	90·58	1·58	1·87	2·20	4·32	100·55.

L. J. S.

The supposed presence of Germanium in Euxenite, Samarskite, &c. Gabriele Lincio (*Centr. Min.*, 1904, 142—149).—Mendeléeff's suggestion that ekasilicon (germanium) might be found to be present in complex minerals containing titanium, zirconium, and niobium led to the determination by Krüss (1888) of about 0·1 per cent. of germanium in euxenite, and by Chrustchoff (1892 and 1894) of 1·5 per cent. in samarskite and traces in tantalite, fergusonite, niobite, gadolinite, &c. The author has made a detailed examination of several samples of euxenite and samarskite from various localities, but failed to detect even a trace of germanium. Winkler had previously also failed to detect the presence of germanium in a sample of euxenite. Krüss's preparations have been re-examined by the author and found to be free from germanium. The sources of error are fully explained. Germanium is therefore known to occur only in the sulpho-salts argyrodite, canfieldite, and franckeite. L. J. S.

Zeolites [Zeophyllite and Natrolite] from Gross-Priesen, Bohemia. Anton Pelikan (*Ber. Akad. Wien, Math.-Naturw. Cl.*, 1902, **111**, (i), 334—347).—The name *zeophyllite* is given to a mineral occurring as hemispheres composed of radially arranged plates, which have a perfect cleavage with pearly lustre in one direction. Indistinct crystals are rhombohedral, and etched figures on the basal (cleavage) plane indicate tetartohedral symmetry. The central portion of a cleavage flake is uniaxial and negative, whilst the surrounding portions are optically biaxial; the latter, however, become uniaxial when the crystal is heated. Sp. gr. 2·764. The mineral is decomposed by hydrochloric acid with separation of silica. Analysis I, by E. Zdarek, gives the formula $H_4F_2Ca_4Si_3O_{11}$. Before the blowpipe, the mineral behaves like a zeolite, and many of its characters indicate a close relation to apophyllite.

	SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.	Na_2O.	K_2O.	H_2O.	F.	Total, less O for F.
I.	38·84	1·73	0·10	44·32	0·17	0·38	0·24	8·98	8·23	99·52
II.	46·95	26·79	—	0·27	—	16·23	1·38	9·46	—	101·08

Zeophyllite occurs in association with apophyllite, natrolite, analcite, and calcite in cavities in felspar-basalt. Goniometric and optical determinations and an analysis (II) of the natrolite are given.

L. J. S.

Association of Natrolite and Datolite at Pokolbin, New South Wales. C. Anderson (*Records Australian Museum*, 1904, **5**, 127—130).—A white, radially fibrous mineral occurring in cavities in an amygdaloidal hypersthene-andesite at Pokolbin, Co. Northumberland, was seen, on microscopical examination of thin sections, to consist of needles of natrolite with a second mineral in the interspaces. The variations in sp. gr. (2·27—2·54) and in composition (analyses I—IV) also point to the material being a mixture. One specimen (anal. IV), with much the appearance of the others, consists of natrolite alone; the others (I—III) are mixtures of natrolite and datolite.

	SiO_2.	Al_2O_3.	CaO.	K_2O.	Na_2O.	B_2O_3.	H_2O (100°).	H_2O (>100°).	Total.
I.	43·47	16·07	14·54	8·96		9·93	6·87		99·84
II.	43·44	18·67	13·06	0·39	9·23	[8·06]	0·26	6·89	100·00
III.	44·25	23·47	8·43	11·57		[4·76]	7·56		100·00
IV.	46·91	27·10	0·63	0·14	15·65	—	0·34	9·38	100·15

L. J. S.

A New Variety of Orthoclase. Louis Duparc (*Compt. rend.*, 1904, **138**, 714—715).—Intergrown with albite in the granite of

Troitsk, northern Urals, is an orthoclase in which the acute bisectrix of the optic axes is perpendicular to the plane of symmetry and is positive in sign; the extinction on the plane of symmetry is +6° to +9°. The same characters have also been rarely observed in the orthoclase of the protogine of the Alps. For this optically abnormal variety of orthoclase (*Fr.* orthose), the name *isorthose* is proposed.

L. J. S.

Lawsonite. Waldemar T. Schaller and William F. Hillebrand (*Amer. J. Sci.*, 1904, [iv], 17, 195—197. Compare Abstr., 1896, ii, 370).—A crystallographic description is given of new material from the original locality, Marin Co., California, and two new forms noted. Analysis of carefully purified material of sp. gr. 3·121 gave the following results, which agree closely with the formula previously given, namely, $H_4CaAl_2Si_2O_{12}$. The blowpipe reactions of the mineral are given in detail.

SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	K_2O.	Na_2O.	H_2O (ignition).	Total.
38·45	0·38	31·35	0·86	0·10	trace	17·52	0·17	0·23	0·06	11·21	100·33

L. J. S.

Picrite and its Alteration Products. Reinhard Brauns (*Jahrb. Min.*, 1904, *Beil.-Bd.*, 18, 285—334).—A description is given of the Upper Devonian picrite of the neighbourhood of Dillenburg, Nassau; it differs from the Middle Devonian picrite of the same district in containing no primary hornblende. The original minerals are: olivine (anal. I), bytownite, augite (II), chromiferous magnetite (III), &c.; secondary minerals are: serpentine, radiotine (IV and V), webskyite, chlorite, pseudophite, fibrous augite and hornblende, garnet (VI), quartz, magnetite, hæmatite, calcite, aragonite, and apatite.

The name *radiotine* is given to a radially fibrous mineral occurring as aggregates of small spheres in the serpentine. In thin sections, it is colourless and transparent; the axis of greatest optic elasticity coincides with the length of the fibres. Analyses IV and V, by F. W. Küster, show that the new mineral has the same composition as serpentine ($Mg_3Si_2O_7,2H_2O$), but it differs from this in not being attacked by hydrochloric acid and in its lower specific gravity of 2·70.

	SiO_2.	TiO_2.	Al_2O_3.	Cr_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	H_2O.	Total.	Sp. gr.
I.	39·45	—	0·21	—	—	18·88	—	1·28	39·47	—	99·29	3·36
II.	51·62	2·99	4·75	2·95	—	5·06	—	18·00	14·60	—	99·97	3·33
III.	6·40	—	little	8·88	much	much	—	2·78	5·43	—	—	—
IV.	41·48	—	—	—	8·40	—	—	1·50	35·84	11·96	99·18	2·70
V.	41·50	—	—	—	8·50	—	—	0·55	35·73	12·13	98·41	
VI.	35·05	—	0·32	—	30·34	—	1·06	32·52	1·78	1·32	102·29	—

L. J. S.

Eclogite-bearing Breccia from the Bingera Diamond Field. George W. Card (*Records Geol. Surv. New South Wales*, 1902, 7, 29—39).—A petrographical description is given of the materials of a breccia filling a volcanic pipe at Ruby Hill, near Bingera, which presents many resemblances to the diamond-bearing breccia of South Africa (Abstr., 1899, ii, 769; 1901, ii, 251). The eclogite (analysis I) is composed of garnet, pyroxene (omphacite, sp. gr. 3·338, anal. II), felspar, and cyanite. Analyses, by H. P. White :

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	Na_2O.
I.	43·05	20·74	4·55	4·08	0·23	7·06	15·30	1·59
II.	45·92	12·03	2·24	1·73	trace	13·30	22·73	1·19

	K_2O.	H_2O.	TiO_2.	CO_2.	P_2O_5.	V_2O_5.	Total.
I.	0·21	3·47	trace	—	0·02	trace	100·30
II.	0·32	0·66	trace	0·39	—	trace	100·51

L. J. S.

Gabbro-rocks of the Val Tellina. Otto Hecker (*Jahrb. Min.*, 1903, *Beil.-Bd.*, 17, 313—354).—In the neighbourhood of Leprese, in the Upper Val Tellina, Lombardy, is a series of rocks of the gabbro family, which vary from olivine-gabbro to hornblende-gabbro and norite (and in one instance approaching to diorite) according to the relative amounts of the ferromagnesian minerals present, namely, diallage, brown hornblende (anal. V), olivine, rhombic pyroxene (VI), and biotite. Analyses of the felspars of these rocks are given under I—IV. Several bulk analyses of the rocks themselves are also given.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	CaO.	MgO.	Na_2O.	K_2O.	Total.	Sp. gr.
I.	52·19	31·94	—	—	10·82	—	4·87	0·41	100·23	2·699—2·704
II.	52·10	30·60	—	—	12·22	—	4·80	0·20	99·92	2·724
III.	56·00	27·81	—	—	9·29	—	5·97	0·57	99·64	2·696
IV.	53·83	29·53	—	—	12·96	—	3·81	0·49	100·62	2·697
V.	48·04	8·98	—	16·44	6·72	18·87	—	—	99·05	3·269
VI.	50·76	5·86	0·49	11·39	15·19	15·19	—	—	98·88	3·230

L. J. S.

Coral-rock from Borings in the Funafuti Atoll. John W. Judd (*The Atoll of Funafuti, Royal Soc. Rep., London*, 1904, 362—389).—The coral-rock is composed essentially of calcium and magnesium carbonates, with only small amounts of insoluble inorganic matter (usually less than 0·01 per cent.) and calcium phosphate (about 0·2 per cent.). The proportion of magnesium carbonate rises, in the first 50 feet of descent in the borings, from the normal of 1 to 5 per cent. up to a maximum of nearly 16 per cent., which is attained at a depth of about 25 feet, and then declines again to what may be considered the normal amount of 1 to 5 per cent. At 637 feet, the percentage of magnesium carbonate again rises from this normal, and by 660 feet has reached nearly 40 per cent. This proportion, with some small exceptions, is maintained to the bottom of the bore-hole at 1114 feet. The increase of magnesium carbonate in the higher levels is no doubt due to the leaching out of calcium carbonate by sea-water containing carbon dioxide, whilst the increase at greater depths is probably due to replacement of calcium by magnesium from the sea-water.

L. J. S.

[Meteorites of Schafstädt, Pavlovka, and Linum.] Carl Klein (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 114—153).—A list is given of the meteorites represented in the University collection at Berlin, with notes on those recently acquired.

Schafstädt, Merseburg.—This stone consists of leucite, anorthite, augite, glassy ground-mass, and ore, having the same composition as a leucite-tephrite. Leucite, which is present as icositetrahedra with twin-lamellæ, has not before been recognised as a meteoric mineral, and the name *leuciteuranolith* is given to this type of meteorite.

Pavlovka, Balachev, Russia.—This contains augite, bronzite, enstatite, olivine, anorthite, and perhaps leucite. Analysis, by Lindner, gave the results under I.

Linum, Brandenburg.—A chrondritic stone with olivine, bronzite, augite, metallic iron, labradorite, and troilite. Analysis II.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	CaO.	MgO.	Na_2O.	K_2O.	MnO.	Metallic iron.
I.	50·91	6·30	12·74	5·95	6·24	14·69	2·04	0·43	0·30	—
II.	43·05	2·44	—	1·32	3·49	25·72	1·39	0·26	0·20	15·83

	Iron combined with S.	Ni.	Cu.	S.	P.	TiO_2.	Cr_2O_3.	H_2O.	Total.	Sp. gr.
I.	—	0·10	0·12	—	—	0·03	—	0·44	100·29	3·335
II.	3·23	0·71	—	1·85	0·07	—	0·31	0·12	99·99	3·542

Ternera, Atacama, Chile.—Analysis III.

	Fe.	Ni.	Co.	S.	P.	Total.	Sp. gr.
III.	82·17	16·22	1·42	0·13	0·11	100·05	7·694

L. J. S.

Physiological Chemistry.

Rhythms of Susceptibility and of Carbon Dioxide Production in Cleavage. E. P. LYON (*Amer. J. Physiol.*, 1904, 11, 52—57).—The fertilised egg of *Arbacia* is especially sensitive to the action of temperatures between 32° and 36° just before cleavage, and resistant 10—20 minutes later. Just after the first cleavage, it is again resistant, and susceptible just before the second. There are also resistant and susceptible periods to the effect of cold, and to lack of oxygen. The production of carbon dioxide is also rhythmic, the greatest amount being produced at the time of active cytoplasmic division.

W. D. H.

Permeability to Ions of Blood-corpuscles. RUDOLF HÖBER (*Pflüger's Archiv*, 1904, 102, 196—205).—Under the influence of carbon dioxide, the blood corpuscles of man and frog take on electrical properties which render their membrane permeable to anions. This fails in the absence of carbon dioxide. Cathions like Fe^{+++} and Al^{+++}, which act like H^+ on anodic colloids, cause no permeability to anions. The production of anion permeability is a reversible process. The blood of fresh water fish freezes at −0·558°. W. D. H.

Blood-platelets and Coagulation. K. Bürker (*Pflüger's Archiv*, 1904, **102**, 36—94).—The blood-platelets are regarded as independently formed elements of the blood. Methods are described for obtaining them, and also for estimating the coagulation time of blood. Blood coagulation stands in the closest relationship to the breakdown of the platelets; they are believed to contribute directly to fibrin formation.
W. D. H.

Blood Coagulation. P. Morawitz (*Beitr. chem. Physiol. Path.*, 1904, **5**, 133—141. Compare this vol., ii, 59).—A further contribution to a study of blood-coagulation, especially in reference to the varieties of pro-ferment. The principal new idea now introduced is that a *kinase* analogous to Pawloff's enterokinase is necessary to effect the change. A substance called thrombogen, when acted on by the kinase, yields a pro-ferment; this, when acted on by calcium ions, yields the ferment. W. D. H.

Influence of Inhibiting Agents on the Coagulation of Bird's Plasma. Ernst Fuld and Karl Spiro (*Beitr. chem. Physiol. Path.*, 1904, **5**, 171—190).—Blood plasma of the bird obtained after peptone injection coagulates on the addition of muscle extract; the time relationship of the clotting with varying quantities of extract follows Schutz's law very closely. As Wooldridge showed with dog's peptone plasma, it does not clot with fibrin ferment; the organ extracts contain some zymoplastic substance or metaferment which is probably the same as Morawitz's β-prothrombin. Investigations of leech extract plasma from birds, and the antagonism of "hirudin" towards organ extracts, yield complicated results. The question of what anti-substance is present in peptone plasma is also discussed. Morawitz's idea that a kinase is necessary is supported. The complexity of the subject is intensified by the introduction of a number of new terms (cytozyme, plasmozyme, holozyme, &c.), which sufficiently demonstrate the uncertainty of present theories. W. D. H.

Blood Coagulation in Arthropods. Leo Loeb (*Beitr. chem. Physiol. Path.*, 1904, **5**, 191—207).—In arthropods (crabs, lobsters, &c.), the so-called first coagulation is an agglutination of the corpuscles, and is inhibited by anti-agglutinating agents. It is analogous to the agglutination of blood-platelets in vertebrate blood. This is independent of the second coagulation, or formation of fibrin, although after a time the agglutinated corpuscles look like fibrin threads. The agglutinated mass has a strongly coagulating action on the fibrinogen of the plasma. The agglutinated cell masses of goose's blood have a similar action on invertebrate blood, but a relatively weak action on goose's blood-plasma. The action of tissue "coagulins" (from muscle, liver, lymph glands) is specific in both classes. These are rendered inactive by great dilution of the blood, although the blood clot will still produce coagulation. True fibrin formation does not, however, occur in all invertebrates. Leech extract has little or no action on invertebrate blood. *In vitro*, Witte's peptone hastens the coagulation of goose plasma, and inhibits that of lobster plasma. Merck's peptone is in both cases almost inactive. Foreign substances, such as filter paper, hasten the clotting of vertebrate blood, but have no action on invertebrate blood. In all cases, the presence of calcium is important. W. D. H.

Specific Erythrolysis. Clarence Quinan (*Beitr. chem. Physiol. Path.*, 1904, 5, 95—109).—Diffusible material plays no part in erythrolysis; the blood proteids have no specific action. The hæmolysis is attributed to specific colloidal substances, which act in the manner of enzymes. W. D. H.

Oxidation and Reduction in Animal Organism. Joseph H. Kastle and Elias Elvove (*Amer. Chem. J.*, 1904, 31, 195—207).—The research originated from the idea that changes of the nature of nitrification and denitrification can be brought about by higher as well as by lower organisms. The experiments were made on rabbits fed on oats; on this diet, their urine shows no reaction for nitrates or nitrites. Various substances were then injected subcutaneously. The results show that nitrous acid and nitrites are partially oxidised to nitrates, and that nitric acid and nitrates are partially reduced to nitrites. Corresponding results were obtained with higher plants. It is a striking fact how many poisons are either powerful oxidising or reducing agents; the following list contains examples: nitrates, chlorates, arsenates, nitrobenzene, picric acid, chromates, organic peroxides and peracids are toxic oxidising compounds. Nitrites, hydrogen sulphide, arsenites, aniline, phosphorus, phosphine, hydroxylamine, phenylhydrazine, benzene, toluene, terpenes, and other hydrocarbons, formaldehyde, acetaldehyde, and other aldehydes, methyl, ethyl, amyl, and other alcohols, catechol, resorcinol, quinol, pyrogallol are examples of toxic reducing substances. In this list, no oxidising substance is included but such as is known to be reduced in the organism, and no reducing substance but such as is known to undergo oxidation in the body. In a series of analogous compounds, toxicity and power to effect oxidation or reduction stand in the same order. It is further noted that many pathogenic organisms are anaërobic, or may be so; the growth of bacteria in an impoverished oxygen-supply often results in the development of toxins. Probably the toxins themselves belong to the class of reducing poisons.

W. D. H.

Absorption and Kataphoresis. Rudolf Höber (*Pflüger's Archiv*, 1904, 101, 607—635).—A theoretical discussion of the factors concerned in absorption, and an attempt to explain it on physical grounds. Reid's objections to a theory of electro-osmosis are not considered fatal to its acceptance. W. D. H.

Absorption and Assimilation of Iron. S. Tartakowsky (*Pflüger's Archiv*, 1904, 101, 423—553. Compare this vol., ii, 189).—Further experiments which show that iron administered as a medicament is really absorbed and assimilated, and is therefore available for hæmoglobin formation. In fact, it behaves in every way like the organic iron compounds of the ordinary food. A very complete review of previous work on the subject is given, and the views of others are discussed. W. D. H.

Synthesis of Higher Fatty Acids in the Liver. O. HILDESHEIM and JOHN B. LEATHES (*Proc. Physiol. Soc.*, 1904, i—ii; *J. Physiol.*, 31).—Minced liver contains from 10 to 40 per cent. more fat after incubation in a current of moist air for 1—3 days than it does when fresh. Immersion of the flasks in boiling water prevents this increase. Putrefaction was hindered, but not wholly prevented, by antiseptics, but the organisms are not responsible for the increase of fatty acids. If glycogen is added to the flasks, the increase is still more marked.
W. D. H.

Influence of Castration on the Phosphorus of the Female Organism. FELIX HEYMANN (*Zeit. physiol. Chem.*, 1904, 41, 246—258).—A retention of phosphorus is described by some authors as a metabolic result of castration in female animals. This is incorrect, indeed in many cases the phosphoric acid in the skeleton is lessened. Lecithin is unaffected. W. D. H.

Physiology of the Thymus. DIARMID NOËL PATON and ALEXANDER GOODALL (*J. Physiol.*, 1904, 31, 49—64).—In guinea-pigs, the thymus grows until the animal reaches the age of about two months, when the animal has an average weight of 300 grams, and is capable of reproduction; after this it degenerates. Removal of the organ has no influence on growth, or on the red corpuscles. There is a decrease in all varieties of leucocytes. When such animals become pregnant, leucocytosis occurs as usual. Infection with tubercle, injection of terebene (causing leucocytosis) produce the same effect as in normal animals; the resistance of the animals to the diphtheria toxin is unchanged. Injection of broth cultures of staphylococci and streptococci do not usually produce the marked leucocytosis seen in normal animals. W. D. H.

Physico-chemical Behaviour of Liver Cells. EUGEN PETRY (*Beitr. chem. Physiol. Path.*, 1904, 5, 245—275).—An investigation of the effects of acids, alkalis, &c., on liver cells, similar to those carried out by others on blood corpuscles. The main point investigated is the permeability to chlorine, and the results are on the whole similar to those previously obtained with blood corpuscles. W. D. H.

Secretion of Feather Glands. FRANZ RÖHMANN (*Beitr. chem. Physiol. Path.*, 1904, 5, 110—132).—The origin of fat from proteid is a much debated question. Some believe that it is proved by the formation of fat in the cells of the mammary and sebaceous glands; others, on histological evidence, believe this may be explained by the capacity of the cells to pick out the fat from the nutrient blood stream. In the present research the Bürzel glands of the bird were investigated;

although small quantities of glycerol are present, the principal alcohol is octadecyl alcohol, and the fatty acids present are combined as esters of this. Feeding experiments with various fats were carried out, and an alteration in the secretion and in the composition of the subcutaneous fat also were observed. Histological observations were also made. All the observations support the theory that a fatty degeneration of cell-protoplasm does not occur, but that the material is formed by simple chemical processes from the fat of the blood stream.

W. D. H.

Amount of Fat in Muscle. JOHN B. LEATHES (*Proc. Physiol. Soc.*, 1904, ii—iii; *J. Physiol.*, 31).—The figures given show that the red muscles of the rabbit, such as those of the diaphragm, soleus, and heart, contain a greater store of fat than the white muscles of the same animal or the mixed muscles of the cat. W. D. H.

Composition of Bear's Fat. PAUL N. RAIKOW (*Chem. Zeit.*, 1904, 28, 272—273).—An analysis of bear's grease both from the belly and the kidneys. It transpired that the animal had fed chiefly on hazelnuts.

	Belly fat.	Kidney fat.
Sp. gr. at 15°	0·9209	0·9211
Melting point of insoluble acids	32—32·25	30·5—31
Acid number	2·2	2·2
Ester number	192·6	198·1—198·3
Iodine number	98·5	107·4—106·5
Reichert-Meissl number	1·66	1·15
Refractometer degrees at 25°	61·2	61·2
,, ,, 40°	53	53

Once melted, the fat remained practically liquid at the ordinary temperature. There is little doubt that its peculiar properties are due to the fact that it was chiefly derived from hazel-nut oil. L. DE K.

Antitoxin Formation in Autolysis. LEON BLUM (*Beitr. chem. Physiol. Path.*, 1904, 5, 142—170).—Various organs were subjected to autolysis and the products examined for antitoxic substances. The toxins against which they were tested were cobra poison, diphtheria toxin, and tetanus toxin. The only positive result obtained was in the case of lymph glands, which on autolysis develop an antitoxin towards the tetanus poison. This is absent in the fresh gland. Details of its action are described in full. W. D. H.

Physical Chemistry of Agglutinins. SVANTE ARRHENIUS. (*Zeit. physikal. Chem.*, 1903, 46, 415—426).—This paper consists of an examination of the results already published by Eisenberg and Volk (*Zeit. Hygiene*, 1902, 40, 155—195) in order to show how they may be employed quantitatively. It is shown that the figures may be used in this way, and the formulæ deduced are of quite a simple character. W. D. H.

Composition of Goat's Milk. Paul Buttenberg and F. Tetzner (*Zeit. Nahr. Genussm.*, 1904, 7, 270—272).—The following table shows the composition of the milk of 5 goats of different ages. Each milk was examined separately and the analyses were made on 7 consecutive days:

Age of Goat.	Time of milking.	Fat per cent.	Non-fatty solids per cent.
5 years	Morning	2·1—2·5	7·13—7·71
	Evening	2·3—2·8	7·37—7·59
3 years	Morning	2·5—3·4	8·01—8·43
	Evening	3·0—3·9	8·18—8·52
2½ years	Morning	3·4—3·7	8·19—8·53
	Evening	4·0—4·7	8·14—8·59
3 years	Morning	2·6—3·0	8·02—8·23
	Evening	3·1—3·4	7·91—8·38
2 years	Morning	3·8—4·4	8·82—9·07
	Evening	4·9—5·6	8·59—8·99

W. P. S.

Action of Chloral on the Secretion of Bile. Arthur Falloise (*Bull. Acad. Roy. Belg.*, 1903, No. 12, 1106—1129).—Chloral hydrate introduced in the dog's duodenum produces, after a latent period of 2 or 3 minutes, a remarkable acceleration of the flow both of bile and pancreatic juice; the former persists for several hours, the latter for about 30 minutes. The persistence in the case of bile is due to the action of the absorbed drug on the liver cells; this action has a latent period of 15—20 minutes. The early increase in the flow of both juices is due to the formation in the intestinal mucous membrane of a new substance (*chloral-secretin*) analogous to Starling and Bayliss' secretin. Chloral-secretin can also be prepared *in vitro* from the duodenal mucous membrane. W. D. H.

Toxic Properties of Bile. Marc Armand Ruffer and Milton Crendiropoulo (*J. Pathol. Bacteriol.*, 1904, 9, 278—310).—Bile is toxic not only for members of another species, but also for the same species. The principal effects studied were the inflammatory lesions at the point of subcutaneous injection and the effects on the blood. The latter are complex, for the groups of hæmolysins present are admixed with antihæmolytic (hæmosozic) substances.

W. D. H.

Excretion of Strontium. Lafayette B. Mendel and Henry Clarke Thacher (*Amer. J. Physiol.*, 1904, 11, 5—16).—Strontium salts are eliminated to a slight extent by the kidney, even although they are directly introduced into the circulation of animals (dogs, cats, rabbits). The excretion in the urine begins soon and ceases usually within 24 hours. Whatever be the manner in which the salts are introduced, the larger portion will be found in the fæces; the place of excretion is apparently restricted to the region beyond the stomach. A functional relation to certain phenomena of peristalsis is suggested. The rate of elimination is slow and is influenced by the amount of calcium in the food. Strontium is found deposited in the body chiefly in the bones, but traces are discoverable in the liver and muscles. W. D. H.

Proteid in Urine. Adolf Oswald (*Beitr. chem. Physiol. Path.*, 1904, 5, 234—244).—The examination of the urine was made in cases of cyclic albuminuria. The proteid matter consisted of albumin and globulin. The globulin was mainly pseudoglobulin. In some cases, a precipitate was obtained by the addition of acetic acid; this does not consist of nucleo-proteid, but of euglobulin and fibrinogen (or fibrino-globulin). A small quantity of phosphorus found is attributed to contamination with lecithin. W. D. H.

Behaviour of Uric Acid in Urine and the Effect of Alkalis on the Solubility of Uric Acid in Urine. Francis H. McCrudden (*J. Amer. Chem. Soc.*, 1904, 26, 280—289).—A precipitate consisting of uric acid, or sodium urate, or a mixture of the two frequently separates from urine as it cools. The cause of this precipitation and the factors which determine the amount of uric acid remaining in solution have been widely discussed. It is now shown that the separation of uric acid is due to the concentration of the hydrogen ions being too great to permit of the presence of so large a quantity of negative uric acid ions. The fact that uric acid is not always immediately precipitated from cold urine is owing to the insoluble uric acid assuming the colloidal state. The effect produced on the equilibrium by the addition of small or large quantities of alkali and by changes of temperature is discussed. It is shown that by the addition of alkali to normal urine the solubility of uric acid in it would be increased at the temperature of the body, and that by the addition of considerable quantities of alkali to urine from which uric acid separates while still warm, its power of dissolving uric acid at the temperature of the body would also be increased. It is therefore suggested that in cases of uric acid calculi and gravel as much alkali should be administered as possible without making the urine alkaline. E. G.

Excretion of Phloridzin. Kōtarō Yokota (*Beitr. chem. Physiol. Path.*, 1904, 5, 313—316).—After subcutaneous injection of phloridzin in rabbits, about 92 per cent. is recoverable as such in the urine. If the drug is given by the mouth, the amount recovered is less, probably owing to incomplete absorption. The existence of a lævorotatory substance, into which Cremer believed part of the phloridzin is converted, is considered possible. W. D. H.

Purine Substances in Human Fæces. J. Walker Hall (*J. Pathol. Bacteriol.*, 1904, 9, 246—259. Compare Abstr., 1902, ii, 465).—On a mixed diet, the quantity of purine nitrogen in the fæces varies from 0·01 to 0·03 per diem. Medium amounts of meat and hypoxanthine added to the diet do not raise this figure, but excessive amounts of meat, thymus, or guanine do. In diarrhœa, the fæcal purine is increased; in rheumatism it is not. The fæcal purine originates from shed nuclein, bacteria, and intestinal secretions. The nuclein is to some extent decomposed in the alimentary canal; the resulting adenine and guanine may be excreted as such, or may be oxidised to form xanthine and hypoxanthine. W. D. H.

Milky Ascites in Carcinoma. HEINRICH WOLFF (*Beitr. chem. Physiol. Path.*, 1904, 5, 208—211).—Analytical details of the composition of the ascitic fluid in a case of abdominal cancer are given. Most interest attaches to its milky appearance; the fat-like material was shown to consist of an oleic acid ester of cholesterol, and is believed to have been chemically united to the euglobulin fraction of the proteids. W. D. H.

Action of a Salt Solution in Locomotor Ataxy. SAMUEL A. MATTHEWS and ORVILLE H. BROWN (*Amer. J. Physiol.*, 1904, 11, 1—4). —The subcutaneous injection of a mixture of 250 c.c. of $m/8$ sodium chloride, 125 c.c. of $m/8$ sodium sulphate, 120 c.c. of $m/12$ sodium citrate, and 5 c.c. of $m/8$ calcium chloride in cases of locomotor ataxy causes pains similar to those felt in the early stages of the disease, even although it may have been years since the pains were felt. The pains decrease successively after each injection, until about the fourth or fifth, after which they may not occur at all. The procedure was found to have no therapeutic value, but the reaction may be of diagnostic value. The sensations are not elicited in normal individuals. W. D. H.

Cytodiagnosis in Nervous Diseases. CHARLES L. DANA and T. W. HASTINGS (*Medical Record, New York*, 1904, Jan. 23).—The paper relates mainly to the examination of the cellular elements in the cerebro-spinal fluid of cases of nervous disease. The fluid was obtained during life by lumbar puncture. A point of chemical interest noted is that in two cases of alcoholic psychosis, choline was obtained from the fluid, in confirmation of Mott and Halliburton's statement. W. D. H.

Action of Chemical Stimuli. HERMANN BRAEUNING (*Pflüger's Archiv*, 1904, 102, 163—184).—Acids act as stimuli in eliciting reflexes; they act in virtue of a diffusion process. Different acids of the same concentration act in relation to their diffusion coefficients. The negative ion in molecular solutions of acids has no important influence. Acids may be arranged in order of toxicity, beginning with the strongest as follows: hydrochloric, nitric, acetic, sulphuric. W. D. H.

Antiseptic and Physiological Action of Persulphates. DIOSCORIDE VITALI (*Chem. Centr.*, 1904, i, 749—750; from *Boll. Chim. Farm.*, 43, 5—11. See this vol., ii, 366).

Resolution of Salol in the Organism. VALERIO LUSINI (*L'Orosi*, 1903, 26, 47—51).—The author has made a number of experiments to determine what products in the organism bring about the resolution of salol into phenol and salicyclic acid, to which it owes its therapeutical value. To obtain the salol germ-free, it was dissolved in ether or chloroform, and after some time the solvent was distilled off in a vacuum in sterilised vessels. Salol is decomposed by germ-free pepsin or pancreatin; the latter is especially active and acts not only in aqueous solution, which may or may not be rendered alkaline, but also in presence of lactic acid or egg albumin. It is also resolved when left in contact with the fæces either of herbivorous animals or of man. *Bacillus coli* rapidly attacks salol, while the typhoid bacillus has very little action. Acid urine also decomposes salol in spite of the fact that it retains its acid reaction. Salol is also resolved by the blood, the serum of which, however, plays no part in the action; the decomposition is brought about only by the morphological elements—mainly by the white corpuscles—and if a protoplasmic poison such as quinine dihydrochloride is present, no action occurs. T. H. P.

Fate of Cyclic Terpenes and Camphor in the Animal Organism. V. Behaviour of Sabinol. EMIL FROMM (*Zeit. physiol. Chem.*, 1904, **41**, 243—245. Compare Abstr., 1902, ii, 341).—Sabinol leaves the body in union with glycuronic acid; this glycuronic acid is the ordinary acid. The semicarbazone derived from it melts at 202—206°, not at 188° as Giemsa (Abstr., 1901, i, 11) stated. W. D. H.

Cryogenine and its Elimination. RÉNÉ COURAUD (*J. Pharm. Chim.*, 1904, [vi], **19**, 344—347).—One hundred parts of the respective solvents dissolve the following weights of cryogenine: acetic acid, more than 100; amyl alcohol, 11·27; acetone, 7·31; ether of 65°, 2·77; water, 2·53; light petroleum, 0·78; chloroform, 0·78; anhydrous ether, 0·026; benzene, insoluble.

Cryogenine was isolated in the crystalline state from the urine voided during 5 days by a healthy man to whom a daily dose of 0·50 gram was administered.

Cryogenine is best detected in the urine by adding to 10 c.c. of it a few drops of phosphomolybdic acid; a blue coloration is obtained with more or less of a green tinge; sometimes a blue precipitate is formed as well. By testing the urine in this way, it was found that a single dose of cryogenine was eliminated from the system in a very short time (about 1½ days); whereas after 5 successive daily doses the elimination was not completed until 4 days had elapsed since the last dose. C. F. B.

Diuretic Action of 1:3-Dimethylxanthine. HEINRICH DRESER (*Pfluger's Archiv*, 1904, **102**, 1—35).—Particulars are given of the course and amount of the diuresis produced by 1:3-dimethylxanthine as contrasted with that of other diuretics. Tables and illustrative diagrams are given. W. D. H.

Pupil Dilatation caused by Adrenaline. S. J. MELTZER and CLARA MELTZER AUER (*Amer. J. Physiol.*, **11**, 28—36, 37—39, 40—51).—Details of experiments on cats and rabbits relating to the paradoxical pupil dilatation which is caused by subcutaneous injection of adrenaline, and which occurs only when the sympathetic is cut or the superior cervical ganglion removed. W. D. H.

Nicotine Poisoning in Rabbits and Guinea-pigs. Robert A. Hatcher (*Amer. J. Physiol.*, 11, 17—27).—Nicotine is uncertain in its action. Death is due to failure of respiration, and artificial respiration to be effective must be commenced before the respiratory centre is markedly depressed. Heat antagonises the toxic effect. No cumulative effects are seen when nicotine is given daily for several days. Nutritional disturbances follow its prolonged use, as is indicated by loss of weight, and the appearance of ulcers near the seat of injection. The preparation of an antitoxic serum was not found to be practicable. The average fatal dose for an adult rabbit is 20 mg. per kilo. of body weight; in the adult guinea-pig this number is 40, but in very young guinea-pigs it is 15. W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Nitrifying Organisms. E. Boullanger and L. Massol (*Ann. Inst. Pasteur*, 1904, 18, 181—196. Compare Abstr., 1903, ii, 679).—The nitrous organism accommodates itself to all the ordinary carbonates, nitrification taking place when magnesium carbonate was replaced by calcium, barium, strontium, zinc, lead, nickel, manganese, copper, iron, or bismuth carbonate. Nitrification took place when the following ammonium salts were employed: arsenate, nitrate, nitrite, borate, bromide, carbonate, chloride, fluoride, thiosulphate, phosphate, sulphite, sulphide, acetate, formate, lactate, malate, succinate, tartrate, urate, and ammonium magnesium phosphate. Ammonium arsenite, iodide, citrate, and oxalate are only nitrified in solutions containing 0·5—1·0 gram per litre.

Hydroxylamine hydrochloride is not attacked by the nitrous organism. The nitric organism oxidises nearly all nitrites in solutions containing 0·5—1 gram per litre.

Experiments on the action of the nitrous organism on ammonium sulphate showed that there was a period of incubation which lasted six days, during which no nitrate was found. In the case of the nitric organism, this period was only two days.

Ammonium salts hinder the multiplication of nitric organism, but unless present in considerable quantity have no retarding action on the oxidising function of existing nitric organisms. Under ordinary conditions, the amount of ammonia in the soil can rarely be sufficient to interfere with the multiplication of the nitric organism. In solutions, the minimum retarding amount was found to be about two per million. N. H. J. M.

Supposed Formation of Nitrogen by Fermentation with Putrefactive Bacteria. Carl Oppenheimer (*Zeit. physiol. Chem.*, 1904, 41, 3—7).—A series of errors in calculation is pointed out in Schittenhelm and Schröter's investigations (this vol., ii, 139). The greater part of the residual gas described as nitrogen was in reality the excess of oxygen previously added. The conclusions drawn as to the evolution of nitrogen are valueless. J. J. S.

Gelatin Surface-colonies of Bacillus Coli Communis. William G. Savage (*J. Pathol. Bacteriol.*, 1904, 9, 347—358).—It is not possible to diagnose this organism from its surface-colonies only, for other organisms may simulate these, and the colonies of the *B. coli* are not always typical. W. D. H.

Agglutination in Dysentery. R. Tanner Hewlett (*Trans. Pathol. Soc. London*, 1904, 55, 51—55).—There appear to be at least two strains of the *Bacillus dysenteriæ*, with a profound difference in agglutinative properties. The value of the agglutination test in dysentery and the specificity of the bacillus are therefore still questions for the future. W. D. H.

Bacteria which are able in Absence of Light to utilise Carbon Dioxide as Source of Carbon. Martinus W. Beyerinck (*Centr. Bakt. Par.*, 1904, ii, 11, 593—599).—The results obtained by Natanssohn (*Mitt. Zool. Stat. Neapel.*, 1903, 15, 655), showing that bacteria occur in the sea which reduce carbon dioxide by oxidation of hydrogen sulphide or thiosulphates, are confirmed. It was also found that sodium tetrathionate in presence of sodium carbonate yields sodium sulphate, sulphur, and carbon dioxide. Sodium dithionate was not attacked.

A bacterium, *Thiobacillus denitrificans*, was obtained from ditch water, which utilises free sulphur, converting carbonates and nitrates into sulphates with liberation of carbon dioxide and nitrogen.

N. H. J. M.

Bacterial Origin of the Gums of the Arabin Group. R. Greig Smith (*Centr. Bakt. Par.*, ii, 1904, 11, 698—703).—Cultivations of *Bacterium acaciæ* and *B. metarabinum* in media containing sucrose and asparagine produced acetic acid and a small amount of formic acid, together with *l*-lactic acid, a little succinic acid, and traces of oxalic acid. Tannic acid was also found.

B. acaciæ was found in the gum of plum trees and cedar, in peach trees, and in the gum of almond and Japanese date trees. *B. levaniformans* was found in peach and Japanese date tree gum. The gum of peach trees is possibly in part produced by *B. Persicæ*, which was also found.

The gum in the fruit of *Sterculia diversiola* consists of arabin and parabin, produced respectively by *B. acaciæ* and *B. parabinum*. Several varieties of the latter occur, all of which produce parabin mucus.

In experiments with peach, almond, and *Cedrela australis*, an organism (*B. Persicæ*) was obtained which produces mucus on sucrose-potato-agar and in solutions containing sucrose. The mucus, when hydrolysed, yielded galactose and arabinose. During the fermentation of sucrose, carbon dioxide and alcohol were produced together with butyric and lactic acids and some acetic acid. Traces of succinic and formic acids were also found. N. H. J. M.

Diplococcus Rheumaticus. James M. Beattie (*J. Pathol. Bacteriol.*, 1904, 9, 272—277).—In two cases of acute rheumatism, the observations recorded confirm the results of Poynton and Paine in ascribing to a diplococcus the causation of the disease.

W. D. H.

Agglutination of Vibrios. Milton Crendiropoulo and Miss B. Sheldon Amos (*J. Pathol. Bacteriol.*, 1904, 9, 260—271).—In cholera patients, several groups of vibrios are found, one only of which is regarded as the true cholera vibrio. The agglutinins of normal and specific serum are not the same. The agglutination of the cholera vibrio by its own specific serum is greatly favoured by the presence of calcium chloride, whereas this is not the case with other vibrios. Special attention is directed to the action of salts on agglutination; some inhibit and others favour the secretion of the agglutinable material by the micro-organisms. W. D. H.

Preparation of Nutrose-Agar. S. W. H. Eyre (*Trans. Path. Soc. London*, 1904, 55, 91—105).—Full technical details for the preparation of this culture medium are given. W. D. H.

Formation of Nitrous Acid in the Air confined in Arable Land. Nitrification by Chemical Processes in the Soil. Fausto Sestini (*L'Orosi*, 1904, 27, 1—9).—It has been stated by Bonnema (*Chem. Zeit.*, 1903, 27, 149) that the formation of nitrous acid in soil is due not to the action of bacteria on atmospheric nitrogen, but to the oxidation of the latter by the ferric hydroxide present in the soil. The author finds, however, that it is not the nitrogen of the atmosphere, but the traces of ammonia contained therein, which undergoes oxidation, yielding nitrous acid; this reaction proceeds in presence of 0·2 per cent. of mercuric chloride or of large quantities of thymol. The nitrous acid formed serves as a food for, but is not produced by, nitric bacteria.

Griess's reagent is capable of reacting with a solution containing only 1 part of sodium nitrite in 30,000,000 of water; a sulphuric acid solution of *m*-phenylenediamine gives a coloration with 1 part of the salt in 1,000,000 of water, but not with 1 part in 10,000,000.

T. H. P.

Gaseous Exchange between the Atmosphere and Plants separated from their Roots and kept in the Dark. Marcellin Berthelot (*Compt. rend.*, 1904, 138, 602—607. Compare *Compt. rend.*, 1904, 138, 16).—The experiments described in this paper were conducted on a species of prairie grass cut in September, 1903, piled in heaps and covered to avoid loss by evaporation; daily observations made during nineteen days on the difference between the temperature of the middle of the mass and that of the air, and on the composition of the air withdrawn by means of an aspirator from the interior of the heap, showed that the chemical action due to ferments and microbes is accompanied by a development of heat, the temperature rising to 53° at the end of a week, and then gradually falling to that of the air (17—21°) at the end of the third week. The air withdrawn from the interior of the heap consists of carbon dioxide, oxygen, and nitrogen only, the sum of the first two constituents being approximately the same as the volume of oxygen in normal air (20—23·1 per cent.), whilst the relative volume of nitrogen does not differ by more than 2·3 per cent. from that of ordinary air. These results show that the gaseous exchange between the atmosphere and the plants is similar to that which characterises animal respiration, (1) the amount of carbon dioxide formed being equal to the amount of oxygen used up, and (2) there being no production of ammonia or liberation of free nitrogen. Under the conditions of the experiment, the nitrogen is converted into urea or ammonium carbonate, for on repeated distillation of the material with excess of water, crystalline ammonium carbonate was obtained.

These results were confirmed by the ultimate analysis of the material before and after the experiment. M. A. W.

Toxic Action of Acids and Salts on Seedlings. (A Correction.) Frank K. Cameron (*J. Physical Chem.*, 1904, **8**, 131).—In a paper on the above subject (this vol., ii, 283), it was stated that the increase of the toxic effect of acids on clover seedlings by the addition of potassium salt was the only instance observed where the addition of a *second* electrolyte did not cause a decrease of toxic effect. It is now pointed out that the author had previously observed some similar cases; for example, sodium chloride causes an increase of the toxic action of sodium sulphate on lupin seedlings, and a few other examples are given. L. M. J.

Choline in Plant and Animal Organisms. Heinrich Struve (*Annalen*, 1904, **330**, 374—379. Compare Abstr., 1902, ii, 636).—Since the discovery of Florence's test for choline (Abstr., 1900, ii, 328), which depends on the formation of crystals of iodocholine when a solution of potassium iodide is added to choline, the recognition of this base has become easy. By this means, it has been shown to occur in three forms in most animal and vegetable organisms: (i) in compounds soluble in ether, lecithin, (ii) in compounds soluble in water, (iii) in compounds with proteids.

The test is applied to the first class of compounds by evaporating the ethereal extract, decomposing the lecithin with sulphuric acid, evaporating with calcium hydroxide, extracting with alcohol, and then applying the test to the residue from the alcohol under the microscope. Choline is readily detected in substances soluble in water. The compounds of choline with proteids must first be separated from fat (lecithin), and secondly from choline compounds in aqueous solution; the choline is then set free by treatment with sulphuric acid or by alcoholic ammonia.

The author's observations have led to the following conclusions: (i) choline is found in the cell-protoplasm in all three forms; (ii) the choline of organic extracts soon disappears under the influence of micro-organisms, to be again formed by these organisms; (iii) all diseases which are characterised by marked cellular growth are accompanied by excretion of choline; (iv) an animal organism does not normally excrete choline; (v) the formation of choline (or lecithin) is not entirely dependent on the presence of phosphoric acid; boric acid can take the place of the phosphoric acid. K. J. P. O.

The Evolution of Terpenoid Compounds in the Vegetable Organism. EUGÈNE CHARABOT and ALEXANDRE HÉBERT (*Ann. Chim. Phys.*, 1904, [viii], 1, 362—432).—A detailed account of work already published (compare Abstr., 1901, ii, 183, 619; 1902, ii, 99, 346, 523; 1903, ii, 172, 233, 505, 607). M. A. W.

Enzymes in the Sugar Beet. JULIUS STOKLASA, JOHANN JELÍNEK, and EUGEN VÍTEK (*Zeit. Zuckerind. Böhm.*, 1904, 28, 233—243. Compare Abstr., 1903, ii, 320, 388, and 746).—The authors show that after anaërobic respiration under a pressure of 350 atmospheres, the sugar beet yields a pressed juice containing invertase.

They have also continued their experiments on the zymase present in sugar beets which have been allowed to respire for some time under water. The beets were pounded, the pasty mass subjected to a pressure of 100 atmospheres, and the juice drawn off, the residue being then submitted to 400 atmospheres pressure and the juice again collected. The fermentative powers of these two samples of juice were found to be approximately equal. The fermentations were carried out in presence of antiseptics, and when 2 per cent. potassium meta-arsenite solution was employed, only in three cases was a slight growth of hyphomycetes and bacteria observed. As with yeast zymase, filtration of the juice through a Chamberland filter causes considerable diminution in its fermentative power, whilst when sterile sand is employed as filtering medium this power is only slightly decreased. T. H. P.

Vetches in Cereal Meal and in Human Food. ALBERTO SCALA (*Chem. Centr.*, 1904, i, 530; from *Staz. sper. agrar. ital.*, 36, 695—716). —Vetches, when dried at 90°, lost 7·65—12·24 per cent. of water. The percentage composition of the dried substance was as follows: nitrogenous matter (*a*, total), 17·7—27·3; (*b*, soluble), 6·0—7·2; albumin, 6·0—6·8; legumin, 6·8—12·0; fat, 1·0—1·3; wood, 3·7—10·7; starch, 64·8—68·8; pentosans, 3·4—5·5; non-nitrogenous extract (free from minerals), 7·2—8·9; and ash, 2·3—2·8.

Vetches are free from poisonous matter, and any objectionable taste is removed by sulphurous acid without any considerable loss in nutritive value. Vetch meal, when mixed with cereal meal or with 4—5 parts of gluten, may be used (in Italy) for making bread.

The methods of Voyl, Robine, Donny, and Valenti for detecting vetch meal are unsuitable for quantitative estimations. The legumin method, digestion for 12 hours with 4 per cent. sodium chloride solution, is preferable. N. H. J. M.

Analytical Chemistry.

Burette arranged to Fill and Level to an Automatic Zero and to return Unused Liquid to the Reservoir. ALVERGNIAT-CHABAUD (*Bull. Soc. chim.*, 1904, [iii], 31, 349—350).—The burette proper is provided with a two-way cock (one passage of which serves for titrating purposes) and communicates both by a side-arm near its mouth and by the second passage of the two-way cock with a tube parallel to itself, which passes to the bottom of the closed reservoir holding the liquid. The cork of the reservoir also carries a tube provided with a caoutchouc ball, which, when pressed, forces the solution into the burette. The apparatus is figured in the original.

T. A. H.

Detection and Estimation of Iodides in the presence of Bromides and Chlorides by means of Potassium Iodate. HUGO DITZ and BENJAMIN M. MARGOSCHES (*Chem. Zeit.*, 1904, 28, 271—272).—A question of priority. The qualitative process communicated by Benedict and Snell (Abstr., 1903, ii, 750) is practically the same as that given by the authors (Abstr., 1902, ii, 12). A quantitative estimation based on the use of potassium iodate will be published in due course. [Benedict and Snell have since published their quantitative process (this vol., ii, 146).] L. DE K.

Estimation of Sulphuric Acid. RICHARD SILBERBERGER (*Monatsh.*, 1904, 25, 220—248. See this vol., ii, 342).

Antiseptic and Physiological Action of Persulphates and their Toxicological Detection. DIOSCORIDE VITALI (*Chem. Centr.*, 1904, i, 749—750; from *Boll. Chim. Farm.*, 43, 5—11).—The antiseptic action of persulphates is only small, and in larger doses they are poisonous. Added to urine they retard the action of urea bacilli, but do not prevent mould formation. The author gives the following test for the detection of persulphates in urine. Addition of potassium iodine liberates iodine. After precipitating with lead acetate, the filtrate becomes turbid on heating and turns yellow. Basic lead acetate gives a precipitate which turns blue when treated with acetic acid and tincture of guaiacum. After precipitating with barium chloride, a further precipitate is obtained on boiling. Hydrogen sulphide causes a turbidity on warming. On adding potassium dichromate and sulphuric acid and shaking with ether, the latter turns dark blue. On heating with a trace of aniline, a brownish-black colour is obtained. Strychnine nitrate causes a crystalline precipitate. When heated with tincture of guaiacum, the mixture turns dark blue.

In cases of suspected poisoning by persulphates it is, however, the vomit which should be subjected to analysis, as there is little chance of finding any persulphate in the blood, urine, or intestines.

L. DE K.

Estimation of Carbon Dioxide in the Air. B. Swaab (*Chem. Centr.*, 1904, i, 745—746; from *Chem. Weekblad.*, 1904, 177—182, 189—192).—Haldane's apparatus (Abstr., 1901, ii, 477) is strongly recommended. L. de K.

Estimation of Nitrites in Waters. J. Desfourneaux (*Ann. Chim. anal.*, 1904, 9, 68). Lucien Robin (*ibid.*, 96).—Desfourneaux describes a method based on the liberation of nitrous acid by salicylic acid in the presence of potassium iodide and titration of the iodine thus set free.

Robin calls attention to his own process published in 1898 (Abstr., 1898, ii, 542), which is practically the same as that of Desfourneaux, acetic acid being used instead of salicylic acid. L. de K.

Use of Antipyrine in Analysis (Nitrite Reactions). C. Reichard (*Chem. Zeit.*, 1904, 28, 339—340).—A criticism of Schuyten's process (Abstr., 1897, ii, 596). The author thinks this an excellent method for the detection of minute traces of nitrous acid. The coloration produced by an acetic acid solution of antipyrine is not, however, always of the same shade and, therefore, is less suitable for quantitative purposes. Acids other than acetic have also been tried, but without any better result. L. de K.

Estimation of Citrate-soluble Phosphoric Acid in Basic Slags. R. Sorge (*Zeit. angew. Chem.*, 1904, 17, 393—397).—An adverse criticism of the method accepted by the "Verband landwirtschaftlicher Versuchsstationen in Deutschen Reiche" for the separation of the silicic acid when testing basic slags. L. de K.

Estimation of Carbon Dioxide in the presence of Chlorine. Max Schlötter (*Zeit. angew. Chem.*, 1904, 17, 301—302).—The author uses his hydrazine sulphate reaction (this vol., ii, 146) for the estimation of chlorine in electrolytic chlorine. One hundred c.c. of the gas are treated in a Bunte-burette with solution of hydrazine sulphate, and the diminution in volume multiplied by two represents the volume of chlorine. After withdrawing the hydrazine solution, the volume of carbon dioxide may be estimated as usual.

The process gives results which agree fairly well with those obtained by the more complicated Offerhaus process (this vol., ii, 86).

L. de K.

Direct Estimation of Free Carbon Dioxide in Natural Waters. A. McGill (*J. Amer. Chem. Soc.*, 1904, 26, 183—186).—The estimation of free carbon dioxide in natural waters should be made at the source in order that accurate results may be obtained. A method suitable for this purpose is described. The carbon dioxide is removed from the water by bubbling air (previously freed from carbon dioxide) through it, and is afterwards led slowly into a series of small bottles which are nearly filled with solid glass beads and contain $N/100$ barium hydroxide solution coloured with phenolphthalein. The number of bottles in which the colour is discharged gives an approximate measurement of the carbonic acid present in the volume of water operated on.

E. G.

Precipitation of Magnesium Oxalate with Calcium Oxalate. NICHOLAS KNIGHT (*Chem. News*, 1904, 89, 146—147).—In the analysis of dolomite, it was found that the magnesium oxalate precipitated with the calcium oxalate varied from an almost inappreciable amount to a considerable quantity. Using 1 gram of dolomite for the estimation, and, after removal of silica, iron, and alumina, precipitating the calcium with a slight excess of *N*/2 ammonium oxalate solution, the calcium oxalate when filtered at the end of 12 hours contained on an average 0·18 per cent. of magnesia. Before precipitating the iron and aluminium, about 2 grams of ammonium chloride were added. In cases where the calcium oxalate was not allowed to remain before filtering, the amount of magnesia in it increased to 1·2 per cent. It is therefore necessary to dissolve the unwashed calcium oxalate precipitate in hydrochloric acid, and then to add ammonia to reprecipitate the calcium oxalate, the two filtrates being united for the estimation of the magnesium.

W. P. S.

Titration of Ferric Iro. LUIGI CARCANO and RODOLFO NAMIAS (*Chem. Centr.*, 1904, i, 754—755; from *Boll. Chim. Farm.*, 43, 54—56).—In estimating ferric iron with potassium iodide in the presence of hydrochloric acid, there is some risk of the reaction being reversed. This, according to the authors, may be prevented by adding about 5 c.c. of chloroform, which, on shaking, removes the bulk of the liberated iodine from the solution. The whole is then titrated as usual with thiosulphate, using starch as final indicator.

L. DE K.

Colorimetric Estimation of Chromium. A. MOULIN (*Bull. Soc. chim.*, 1904, iii, 31, 295—296).—The author has applied the colour reaction between diphenylcarbazide and chromic acid observed by Cazeneuve (Abstr., 1900, ii, 627; 1901, i, 655, and ii, 626) to the estimation of chromium. The diphenylcarbazide solution is prepared by dissolving 2 grams of this substance in 100 c.c. of alcohol (90°), to which 10 c.c. of acetic acid have been added, and diluting to 200 c.c. with alcohol. The standard chromic acid solution contains 0·00005 gram of the acid per c.c.

The chromium compound under investigation is first converted into potassium chromate; for this purpose, oxidation by hydrogen peroxide in presence of potassium hydroxide is recommended, the liquid being finally neutralised with acetic acid.

The estimation is carried out in the usual manner with the precautions that excess of the diphenylcarbazide solution is employed and that the chromate solution under investigation is made approximately of the same strength as the standard chromic acid solution.

T. A. H.

Separation of Chromium and Vanadium. Paul Nicolardot (*Compt. rend.*, 1904, **138**, 810—812).—In the absence of much iron, chromium can be separated from vanadium by converting it into chromyl chloride; for this purpose, the mineral is fused with excess of potassium chlorate and the small quantities of iron and magnesium separated in the ordinary way; the mixture of alkali chlorides, chromates, and vanadates is then treated with fuming sulphuric acid at a temperature of 60°, the chromyl chloride distils off, and the last traces are removed by means of a current of dry air; the vanadium in the residual liquid is treated with alcohol and finally titrated with permanganate.

If much iron is present (ferrochromovanadium irons, steels, &c.), the separation of the chromium and vanadium is effected by treating the compound with hydrochloric acid, oxidising the solution with nitric acid, and evaporating until the greater quantity of the acid is driven off, when the iron oxide is precipitated, carrying the vanadium with it, the chromium remaining in solution (compare Abstr., 1902, ii, 22). The vanadium is separated from the iron by first washing with ammonia and then fusing with alkali salts, and estimated volumetrically. M. A. W.

New Test for Molybdenum. Em. Lecocq (*Chem. Centr.*, 1904, i, 836; from *Bull. Assoc. Belge des Chimistes*, **17**, 412—414).—Diphenylcarbazide has been recommended by Cazeneuve (Abstr., 1900, ii, 627) as a delicate test for some metals, such as copper, mercury, and iron. The author has tried its effect on molybdenum. If a drop of an alcoholic solution of the reagent is added to 40 c.c. of a weak solution of ammonium or sodium molybdate acidified with two drops of hydrochloric acid, the liquid turns indigo-violet, and on adding more of the reagent a violet precipitate is formed. Tungsten, titanium, and vanadium give no reaction. The test works best with an alcoholic solution which has been kept for some time. When substituting other alcohols for ethyl alcohol, colours of a different shade are obtained. L. de K.

Estimation of Titanium in Iron Ores. S. Burman (*Chem. Centr.*, 1904, i, 970; from *Stahl. ü. Eisen*, **24**, 302).—From half to one gram of the powdered ore is ignited for 45 minutes in a current of hydrogen and the reduced mass is boiled with 200 c.c. of water and 10 c.c. of hydrochloric acid. The undissolved matter is fused in a platinum crucible with ten times the bulk of soda (? sodium hydroxide), the fused mass is treated with water, and the insoluble matter washed with dilute soda solution. It is dissolved in hydrochloric acid, reprecipitated by addition of soda, and, finally, heated in a weighed platinum crucible with 10 grams of potassium hydrogen sulphate until dissolved. The mass is then dissolved in 400 c.c. of water, 10 grams of sodium metasulphite are added, the bulk of the acid is neutralised, and the titanium precipitated as orthohydrate by boiling with addition of sodium acetate. It is collected, washed, ignited, and weighed as oxide. It is liable to be contaminated with platinum. To what extent this has occurred may be fairly judged by reweighing the platinum crucible after the fusion with potassium hydrogen sulphate. L. DE K.

Electrolytic Analysis of Gold. F. MOLLWO PERKIN and W. C. PREBBLE (*Electro-Chem. Metall.*, 1904, 3, 490—494).—Gold may be deposited in a very satisfactory manner from solutions of gold salts in ammonium thiocyanate. With currents of 0·2 ampere per sq. decimetre and 2 volts, the deposition of 0·05 to 0·08 gram is complete in from 5 to 6 hours at the ordinary temperature. With a current of 0·5 ampere, the time is shortened to 1½ to 2 hours. A solution of 5 grams of ammonium thiocyanate in about 70 c.c. of water is heated to a temperature of 30° or 40°, the gold solution is slowly added, and the deposition proceeded with. The total bulk of solution employed should be from 120 to 150 c.c.

The deposit of gold may be removed from the electrode in a few minutes by means of a solution containing 2—3 grams of potassium cyanide, and 5 c.c. of hydrogen peroxide in about 100 c.c. of water. In most of the experiments described, gauze flag electrodes were used, but platinum basins were also employed. W. P. S.

Iodine Absorption of Oil of Turpentine. ROBERT A. WORSTALL (*J. Soc. Chem. Ind.*, 1904, 23, 302—303).—Fifty-five samples of undoubtedly pure oil of turpentine had an average iodine absorption (Hübl) of 384. The absorption was found to be completed in from 4 to 6 hours, when about 3 times the total quantity of iodine necessary for complete saturation had been added. The iodine absorptions of the most common adulterants of oil of turpentine are: rosin spirits, 185; rosin oil, 97; kerosene, 0; naphtha, 0; "wood turpentine," 212; and "water-white wood turpentine," 328. The two latter are now largely manufactured, and appear to consist of both terpenes and alcoholic substances. W. P. S.

Estimation of Prussian Blue. CH. COFFIGNIER (*Bull. Soc. chim.*, 1904, [iii], 31, 391—396. Compare Abstr., 1902, i, 664, and Wyrouboff, Abstr., 1904, i, 18).—Solutions of Prussian blue in mixtures of aliphatic alcohols with hydrochloric acid solidify without change of colour when cooled to low temperatures. On addition of water, the Prussian blue is reprecipitated. It is proposed to utilise this reaction for the estimation of this colouring matter in commercial "blues" containing as diluents starch, barium sulphate, &c. About 2 grams of the material are treated with 100 c.c. of a mixture of propyl alcohol and hydrochloric acid, and when the whole of the Prussian blue has dissolved, the mixture is made up to 200 c.c. with the same solvent. If the diluent is soluble, for example, starch, 100 c.c. of the solution are treated with a sufficient quantity of water to completely precipitate the blue; if the diluent is insoluble, 100 c.c. of the filtrate are treated in like manner. The quantity of water necessary to ensure complete precipitation decreases fairly regularly with the increase of concentration of the Prussian blue solution.

In powders containing alumina as a diluent, the solution of the blue takes place slowly, and is only complete after protracted ebullition.

The filtrate from the precipitated Prussian blue always contains some ferric chloride owing to the presence of traces of this salt in many of the Prussian blues of commerce, and also to a slight but negligible decomposition of the colouring matter by the hydrochloric acid. T. A. H.

Estimation of Cyanates. Thomas Ewan (*J. Soc. Chem. Ind.*, 1904, 23, 244).—The estimation of a cyanate in presence of cyanide by precipitation as silver salt is found to be unsatisfactory owing to (*a*) the relatively large solubility of silver cyanate, (*b*) the difficulty of completely separating silver cyanide and silver cyanate, (*c*) the interference of other silver salts which may be precipitated.

The following method is found to give trustworthy and sufficiently accurate results in presence of any of the impurities which are usually associated with cyanides or cyanates. About 1 gram of the substance is distilled with a small excess of sulphuric or hydrochloric acid, and the carbon dioxide evolved absorbed in baryta solution, the barium carbonate formed being collected and titrated with $N/10$ hydrochloric acid. Any carbonate present is determined in a separate portion of the sample by precipitation in the cold with barium chloride. The reaction on which the method is based is $HCNO + H_2O = CO_2 + NH_3$. The ammonia remaining in the acid solution may be distilled off and estimated. This gives a check on the estimation of the carbon dioxide, and also shows whether there is any other nitrogenous substance present. Hydrogen cyanide passes over quantitatively with the carbon dioxide and may be titrated in the filtrate from the barium carbonate. T. E.

Estimation of Formaldehyde and Paraformaldehyde. Clemens Kleber (*Pharm. Review*, 1904, 22, 94).—To a concentrated solution of commercial sodium hydrogen sulphite, which usually contains a considerable quantity of free sulphurous acid, a solution of sodium hydroxide is added, until the odour of sulphur dioxide has disappeared. A slight excess of sodium hydroxide is immaterial. The solution is then diluted with water until 30 c.c. of it exactly neutralise 50 c.c. of N sodium hydroxide solution, using phenolphthalein as indicator. Towards this solution, formaldehyde and paraformaldehyde behave as alkalis and can be titrated accordingly. One c.c. of the solution corresponds with 0·05 gram of either formaldehyde or paraformaldehyde.
W. P. S.

Estimation of Aldehydes and Ketones in Essential Oils and Allied Substances. Herbert E. Burgess (*Analyst*, 1904, 29, 78—88).—The method to which particular attention is directed, and which gives trustworthy results with nearly all aldehydes and ketones generally met with, consists in heating the essential oil with a saturated solution of normal sodium sulphite, a soluble sulphonate being formed. The reaction, in the case of citral, is shown by the equation: $C_9H_{15}\cdot CHO + 2Na_2SO_3 + 2H_2O = C_9H_{17}(NaSO_3)_2\cdot CH(OH)\cdot SO_3Na + 3NaOH$. With a ketonic substance, a similar reaction takes place.

Five c.c. of the oil are introduced into a 200 c.c. flask, having a neck graduated to 5 c.c. in divisions of 0·1 c.c., and a side tube reaching to the bottom of the flask for introducing the oil, reagent, &c. The sodium sulphite solution and a few drops of phenolphthalein solution are now added and the whole heated on a water-bath. The red coloration which appears is destroyed by the careful addition of dilute acetic acid (1 : 10) until, after the addition of a few more drops, no further colour is produced. The oil is then run up into the neck of the flask and its volume read off when cold. The difference between the reading and 5 c.c. gives the amount absorbed.

The method may be applied directly to many oils, but some, such as citron, lime, lemon, and orange oils, in which the amount of aldehyde is small, require to be previously concentrated. Results of experiments with a considerable number of essential oils are given in detail.

W. P. S.

Estimation of Certain Aldehydes and Ketones in Essential Oils. Samuel S. Sadtler (*J. Soc. Chem. Ind.*, 1904, **23**, 303—305).—Several constituents of essential oils, notably citral, cinnamaldehyde, and carvone, may be estimated by titrating the sodium hydroxide liberated when the oils are treated with sodium sulphite solution. In the case of lemon oil, 10 grams of the sample are mixed with 10 c.c. of water and 4 drops of phenolphthalein solution and rendered just alkaline by the addition of *N*/10 potassium hydroxide solution. Twenty-five c.c. of a 20 per cent. sodium sulphite solution are added, an equal amount being measured out as a control. On agitation, a pink colour appears, and is discharged by the repeated addition of *N*/2 hydrochloric acid. When no more alkali is liberated, the mixture is heated on a water-bath and the neutralising continued. The control test is treated similarly. Both solutions are then titrated with *N*/2 sodium hydroxide solution until a pink coloration just reappears. The actual amount of hydrochloric acid used is then calculated into citral by considering that 1 molecule of citral is equivalent to 2 molecules of hydrochloric acid. The author provisionally suggests the equation for the aldehyde reaction as: $R{\cdot}CHO + 2Na_2SO_3 + 2H_2O = R{\cdot}CH(NaSO_3)_2 + 2NaOH + H_2O$, and for ketones, $R'{\cdot}CO{\cdot}R' + 2Na_2SO_3 + 2H_2O = CR_2'(NaSO_3)_2 + 2NaOH + H_2O$.

W. P. S.

Estimation of Sugar in Urine. J. M. A. Hegland (*Chem. Centr.*, 1904, i, 840; from *Pharm. Weekblad.*, **41**, 133—137).—The urine is boiled with a definite volume of Fehling's solution and the excess of copper is estimated by titration with potassium ferrocyanide in the presence of acetic acid. This should be made of such a strength that it corresponds in copper-precipitating power with a 0·5 per cent. solution of dextrose.

L. de K.

A Reaction of Urine with Resorcinol. Rudolf Adler and Oskar Adler (*Zeit. physiol. Chem.*, 1904, **41**, 206—209).—The red colour produced by boiling with hydrochloric acid and resorcinol (Seliwanoff's reaction) is not necessarily due to lævulose. It often is given by diabetic urine free from lævulose, and sometimes by normal urine which has been kept. It is attributed to the presence of nitrites.

W. D. H.

Estimation of Sucrose, Lactose, &c., in Milks, &c. Frederic W. Richardson and Adolf Jaffé (*J. Soc. Chem. Ind.*, 1904, **23**, 309—311).—Gravimetric methods, including the reduction of Fehling's and other metallic solutions, having failed to give trustworthy results, the authors rely on a polarimetric method. In the case of a mixture of sucrose and invert sugar, a reading of the solution is taken both at 20° and 86° and a reading of the inverted solution at 20°. Sucrose has $[\alpha]_D$ $+63·05°$ at 86° instead of $+66·5°$ at 20°, therefore any *plus* reading of the original solution at 86°, divided by 0·6305, gives the amount of sucrose. In 10 per cent. solution at 20°, the rotatory power of invert sugar is $-20°$. The same process is applied to solutions containing sucrose and lactose.

The acid mercury nitrate solution employed to precipitate the proteids of milk completely inverts sucrose when heated to 86°. It is therefore only necessary to take readings of the filtrate at 20° and 86° to estimate the sucrose and lactose. A solution of sucrose is also inverted by boiling with 2 per cent. of citric acid for 10 minutes, whilst lactose is entirely unaffected.

The authors are working out a method for solutions containing sucrose, lactose, and dextrose ("glucose"), based on the very different changes which the three sugars exhibit when heated in solutions containing 10 per cent. of hydrochloric acid.

W. P. S.

Estimation of Starch. William A. Noyes, Gilbert Crawford, Charles H. Jumper, Edgar L. Flory, and Robert B. Arnold (*J. Amer. Chem. Soc.*, 1904, **26**, 266—280).—See this vol., i, 373.

Action of Sodium Peroxide on Vegetable Fibres containing Lignin. A. Duschetschkin (*J. Russ. Phys. Chem. Soc.*, 1904, **36**, 71—77).—The author gives the following general method for determining the proportion of cellulose in vegetable fibres containing lignin. From 0·5 to 2 grams of the fibre (1 part) are treated for 1½ to 6 hours, according to the amount of lignin, with a solution prepared by dissolving 6 parts of magnesium sulphate in 100 of water and then adding 2 parts of sodium peroxide. For substances containing little lignin, such as sulphite cellulose, this treatment may be applied at once and need not be repeated. But when a large proportion of lignin is present, the fibre should be first of all boiled with a 1 per cent. sodium hydroxide solution and then treated twice or three times with the above oxidising mixture, with which it should be alternately boiled and heated on the water-bath. The freedom of the fibre from lignin may be tested by means of a solution of phloroglucinol in concentrated hydrochloric acid. If this treatment does not completely remove the lignin, the fibre may be subjected to the action of dilute potassium permanganate solution for 5—10 minutes and then treated on the filter with sodium hydrogen sulphite solution or very dilute sulphurous acid. The fibre, after treatment with dilute acetic acid to dissolve the magnesium oxide remaining in it, is filtered off on to a hardened filter paper, washed several times with hot water, dried, and weighed. T. H. P.

Estimation of Acetic Acid in Acetate of Lime. ALBERT G. STILLWELL (*J. Soc. Chem. Ind.*, 1904, 23, 305—306).—The following method is described with the hope that a uniform method of analysis for this substance may be adopted. The sample is rapidly passed through a $\frac{1}{4}$-inch sieve and the moisture estimated in it. An average sample is now passed through a 14-mesh sieve and the moisture again estimated. From this finely-divided sample, 2 grams are weighed out, placed in a round-bottomed flask of 300 c.c. capacity and having a neck 4 ins. long, 15 c.c. of syrupy phosphoric acid are added, and all drops carefully washed down from the neck with about 25 c.c. of water. The contents of the flask are then distilled and the distillate collected in an Erlenmeyer flask containing 30 c.c. of standard sodium hydroxide solution. Water is added to the distillation flask from time to time by means of a tapped funnel to keep the volume of liquid as near 40 c.c. as possible. After $1\frac{1}{4}$ hours, the distillate is neutralised by the further addition of standard sodium hydroxide solution, using phenolphthalein as indicator. The distillation is then carried on for 15 minutes longer, or until no more acid distils over. The sodium hydroxide solution used is of such strength that 1 c.c. corresponds with 0·0175 gram of acetic acid. W. P. S.

Estimation of Tartaric Acid. HERM. LEY (*Chem. Centr.*, 1904, i, 837; from *Pharm. Zeit.*, 49, 149).—Tartaric acid is dissolved in the smallest possible amount of water or alcohol, and a sufficiency of an alcoholic 5 per cent. solution of zinc acetate is added; when testing cream of tartar, water should be used instead of alcohol. After boiling for a minute, 100—150 c.c. of alcohol and 5 c.c. of 50 per cent. acetic acid are added, and after heating for 10 minutes on the water-bath, the zinc tartrate is collected, washed with alcohol, and ignited. L. DE K.

Estimation of the Iodine Value of Oils by the Iodine-Bromide Method. LEONARD ARCHBUTT (*J. Soc. Chem. Ind.*, 1904, 23, 306).—Duplicate estimations by this method (Abstr., 1902, ii, 112) were not found to agree as well as duplicates by the Wijs method, the difference being particularly marked in the case of oil of turpentine. The former method also gives lower results with other oils, especially those having high iodine values. W. P. S.

New Reactions for the Detection of Cocaine. C. REICHARD (*Chem. Zeit.*, 1904, 28, 299).—If to a concentrated solution of cocaine hydrochloride is added a strong solution of sodium nitroprusside, a characteristic, red, crystalline deposit of cocaine nitroprusside is obtained; morphine gives no precipitate. Uranium nitrate gives a yellow, crystalline precipitate, presumably a double cocaine-uranium compound. A solid particle of the hydrochloride, when moistened with titanosulphuric acid, remains colourless, but on warming the acid turns a fine violet or blue.

If solid cocaine hydrochloride is rubbed with a little potassium ethyl sulphate and then moistened with a little sulphuric acid, no effect is observed, but on warming a peppermint-like odour is noticed; this reaction is very characteristic and delicate. When the hydrochloride is rubbed with urea and then moistened with sulphuric acid, no change takes place in the cold, but on warming a gradually increasing blue coloration is observed; ethylenediamine hydrochloride may be substituted for urea, but hydroxylamine produces no effect.

L. DE K.

Creatinine and Creatine in Urine. OTTO FOLIN (*Zeit. physiol. Chem.*, 1904, **41**, 223—242).—Creatinine may be estimated by a colorimetric method, based on Jaffé's reaction (Abstr., 1886, 1056). A colorimeter which is provided with two tubes and can be read to 0·1 mm. is employed, also 0·5*N* potassium dichromate solution, a nearly saturated (1·2 per cent.) picric acid solution, and 10 per cent. sodium hydroxide solution. Exactly 8 mm. of the dichromate solution are placed in the one tube, 10 c.c. of urine are placed in a 500 c.c. flask, 15 c.c. of picric acid solution and 5 c.c. of the alkali added, the whole shaken several times, left for a few minutes, and then made up to the mark with water. This solution is placed in the second tube, and the length of solution required to give the same colorimetric effect as the 8 mm. of dichromate determined. The mean of several determinations is taken and then if this value $= x$, $8{\cdot}1 \times 10/x =$ mg. of creatinine in 10 c.c. of urine. If $x < 5$, then only 5 c.c. of urine should be used; for the original solution of $x > 13$, then 20 c.c. of urine should be taken.

The presence of creatine in certain urines has been established by determining the amount of creatinine originally present by the above method, then heating 10 c.c. of the urine with 5 c.c. of *N*-hydrochloric acid for 3 hours on the water-bath, and again determining the amount of creatinine. Any increase in the amount is due to the conversion of creatine into creatinine under the influence of the hydrochloric acid. Some urines are quite free from creatine, others contain minute amounts, and others large quantities.

Details are given for the preparation of pure creatinine from urine.

In the estimation of nitrogen in creatinine by the Kjeldahl method, the best results are obtained when the substance is mixed with concentrated sulphuric acid (20 c.c.), 2 grams of a mixture of copper sulphate (10 per cent.) and potassium sulphate (90 per cent.), 5 grams of water, and 5 grams of crystallised disodium phosphate.

The decomposition is regarded as a process of hydrolysis, hence the need for water, but not for permanganate (compare Malfatti, Abstr., 1903, ii, 754).

J. J. S.

Colour Reactions of Morphine and Codeine. EMILIO GABUTTI (*L'Orosi*, 1903, **26**, 1—2).—Formaldehyde gives the same colour reaction with either morphine or codeine in sulphuric acid solution, but when heated with chloral or bromal, morphine gives a violet coloration and codeine an azure-green in presence of sulphuric acid. If the codeine contains morphine, the azure-green colour becomes brownish-violet. The best method of observing this reaction is to gradually heat and stir well the codeine or morphine with concentrated sulphuric acid in a porcelain basin until a faint red coloration appears and then to add a small quantity of chloral or bromal and continue stirring.

The azure-green liquid obtained with codeine gradually changes its colour to red; this red coloration is also obtained by the addition of a few drops of water or alkali hydroxide.

Dionine (ethylmorphine) exhibits similar behaviour to codeine, whilst eroine (diacetylmorphine) yields a brownish-red coloration.

The other alkaloids of the *Papaveraceæ* such as papaverine, narcotine, thebaine, meconine, &c., do not yield these colour reactions.

T. H. P.

Toxicological Researches on Morphine. Marussia Bakunin and Vincenzo Petitti (*Gazzetta*, 1904, **34**, i, 1—38).—The early part of the paper reviews the work of other investigators in estimating or detecting morphine in the animal organism. Experiments are described in which the quantity of morphine present in the various organs of rabbits which had been killed by injecting the alkaloid (0·8 gram per kilo. of body-weight) was estimated. Different methods of estimation give different results; thus the total amount of morphine in all the organs of two rabbits of equal weight, killed by the injection of 1·2 grams of the alkaloid, was found by Dragendorff's method to be 0·2647 gram and by the Stass-Otto method to be 0·0784 gram; the organs of a larger rabbit into which 1·70 grams had been injected were found by Senkowski's method to contain only 0·0730 gram of morphine. As regards the separate organs, the stomach contains invariably the largest proportion of the alkaloid, followed by the bladder and urine and the large intestine; in the liver, kidneys, brain, heart and spleen, and lungs the amount of morphine present is small, whilst traces only are found in the muscles, brain, and salivary glands.

After a month's putrefaction practically the same amount of morphine is found in the body of a rabbit as immediately after death, but after two months there is a decrease in the quantity of from 20—40 per cent.

The principal result established seems to be the fact that only a small proportion, namely, 5—20 per cent., of the morphine injected can be accounted for; whether this is due to the methods of estimation employed being unsatisfactory or to a modification of the morphine within the organism remains still to be decided.

W. A. D.

General and Physical Chemistry.

Spectrum of Zinc. MAURICE HAMY (*Compt. rend.*, 1904, 138, 959—961).—Taking the red ray λ508 of the cadmium spectrum as a line of reference, the author has measured the wave-lengths of the rays of the zinc spectrum, using the interference method (compare Fabry, this vol., ii, 305), and the results agree so closely with those obtained by Perot and Fabry (*J. Physique*, 1900) that the accuracy of the method is fully established. M. A. W.

[Influence of Temperature on the Specific Rotatory Power of Strongly Optically Active Compounds.] HERMANN GROSSMANN (*Ber.*, 1904, **37**, 1260—1261).—The author in a recent paper (this vol., i, 153) overlooked the results obtained by Frankland and Wharton (Trans., 1896, **69**, 1583). W. A. D.

Recent Researches on Radioactivity. PIERRE CURIE (*J. Chim. Phys.*, 1903, i, 409—449).—The paper contains an excellent summary of the chief work that has been done on radium and radioactivity and has a full bibliography appended. There is necessarily little new in the paper, but the interesting fact of the explosion of a sample of radium chloride on heating is recorded, and the author urges some weighty objections to the orthodox view of the gaseous nature of the emanation. L. M. J.

Application of Blondlot's Rays to Chemistry. ALBERT COLSON (*Compt. rend.*, 1904, 138, 902—904).—When a solution of potassium hydroxide is added to a solution of zinc sulphate, n_1 rays are emitted, and can be detected by the diminution in the brightness of phosphorescent sulphide placed near the tube; the rays disappear before sufficient alkali has been added to completely precipitate the zinc hydroxide, and do not reappear on the further addition of alkali. If, however, the order of the experiment is reversed, and the zinc sulphate solution be added to the potassium hydroxide solution, there is no action on the phosphorescent sulphide, even if a large excess of the metallic salt be added. Similar results are obtained when copper sulphate is used instead of zinc sulphate. The emission of the Blondlot rays is due to the formation of basic salts, $SO_4(Zn{\cdot}O{\cdot}ZnOH)_2$ and

$$Cu(CuO{\cdot}Cu{\cdot}O)_2SO_4$$

respectively, when the alkali is added to the solution of the metallic salt, and the molecular condensation produces effects analogous to those obtained by mechanical compression (compare Blondlot, *Compt. rend.*, 1903, **137**, 962). M. A. W.

Origin of the Blondlot Rays disengaged during Chemical Reactions. ALBERT COLSON (*Compt. rend.*, 1904, 138, 1098—1099. Compare preceding abstract).—The chemical actions which emit Blondlot rays are always accompanied by physical changes such as contraction, cooling, &c., which act in the same sense; thus the crystallisation of a supersaturated sodium sulphate solution emits n_1 rays, probably due to the contraction that accompanies the change. Again, when chrome alum dissolves in cold water to form a violet solution, n rays are emitted, but if it dissolves rapidly in boiling water to form a green solution n_1 rays are emitted; in the first case there is an absorption of heat, and in the second there is a chemical change (2 mols. of the alum losing 1 mol. of H_2SO_4), also accompanied by an absorption of heat, and the rapid cooling produced by these two physical actions is probably the cause of the n_1 rays. M. A. W.

Disruptive Discharge in Air at Normal Pressures and the Action of Radium on it. D. M. Sokolzoff (*J. Russ. Phys. Chem. Soc.*, 1904, **36**, ii, 25—38).—The author's experiments lead to the following conclusions: (1) of the two electric emissions taking place in a disruptive discharge in air at normal pressure, the positive is the essential one. The evidence for this is as follows: the spark jumps to a greater distance from a positive point than from a negative one; when the two electrodes are similar, connection of the anode to earth diminishes the spark, whilst earthing the cathode increases the intensity of the spark; the electric emission from the anode is more intense than that from the cathode and more readily produces a spark; observation of the transformation of a slow discharge into a spark shows that the latter passes from the anode to the cathode; several other published facts indicate the dominant *rôle* of the anode in the formation of a spark, especially the action of a magnetic field, the pressure and fall of potential in the spark, the incandescence of the cathode, and the analogy with the discharge in Geissler tubes. (2) Radium paralyses the positive emission, but has no appreciable action on the negative one; the action of the radium becomes less as the electrode approaches a point in form. (3) If large oscillations are absent from the spark circuit, radium extinguishes a moderately large spark, and this is done the more readily the larger the superficial area of the anode. (4) On an oscillating spark, radium exercises a peculiar action; with a positive point and a negative disc, radium will extinguish a spark if near to it, but will brighten a spark some distance off; all other oscillating sparks are considerably intensified.

T. H. P.

Influence of Temperature on Electrical Conductivity of Potassium. Arciero Bernini (*Nuovo Cimento*, 1903, [v], **6**, 289—297).—The author's measurements of the electrical conductivity of potassium show that this metal is one of the best conductors. Its conductivity diminishes proportionately as the temperature rises. The temperature-coefficient is greater for the liquid than for the solid state, and the variation of the resistance on change of state (at 62·04°) takes place very suddenly, the increase being in the ratio of 1·392 to 1. T. H. P.

Conductivity of Saturated Aqueous Solutions of Black and Red Mercuric Sulphides. Ralph G. van Name (*Zeit. anorg. Chem.*, 1904, **39**, 108—111).—The conductivity of aqueous solutions of black

and red mercuric sulphides was determined. The measurements in the case of the black sulphide were influenced by the fact that the solid itself is a conductor, and it was impossible to avoid the presence of small amounts of it in the liquid between the electrodes; the conductivity of the solid red form, on the other hand, is very slight. The values obtained are quoted. For both sulphides, $K_{25} = 0{\cdot}01$ to $0{\cdot}02 \times 10^{-6}$.
A. McK.

Formation of Complex Ions. HANS EULER (*Ber.*, 1904, **37**, 1704—1714. Compare Abstr., 1903, ii, 544, 717; this vol., ii, 11).—From the *E.M.F.* of concentration cells, metal | metallic thiosulphate + sodium thiosulphate | metallic chloride or sulphate | metal, the values of K are calculated for the complex ions. $TlNa(S_2O_3)_2$, $K = 7 \times 10^{-4}$—9×10^{-4}; $CdNa_2(S_2O_3)_4$, $K = 3{\cdot}5 \times 10^{-8}$—$5 \times 10^{-8}$; $PbNa_2(S_2O_3)_4$, $K = 3{\cdot}5 \times 10^{-8}$—$8 \times 10^{-8}$. Zinc, nickel, and ferrous thiosulphates form few or no complex ions with sodium thiosulphate. The dissociation constants are as follows: Ag, $K = 10^{-13}$; Cd, $\sqrt{K} = 2 \times 10^{-4}$; Pb, $\sqrt{K} = 2{\cdot}5 \times 10^{-4}$; Tl, $K = 8 \times 10^{-4}$; Ni, $\sqrt{K} = >10^{-1}$; Fe, $\sqrt{K} = >10^{-1}$; Zn, $\sqrt{K} = >0{\cdot}5$.

As carbamide does not form complex ions with silver salts, Rosenheim and Loewenstamm's complex cathions are regarded as sulphur, not as nitrogen, combinations (Abstr., 1903, i, 325). The author discusses the cause of the formation of complex ions.
G. Y.

Relation between the Solution Pressure and the Heat of Ionisation of Metals. ARTHUR KORN and EDUARD STRAUSS (*Festschr. Ludwig Boltzmann*, 1904, 277—281).—The authors suppose that forces of repulsion between the particles of a metal are opposed by electrostatic forces acting between positively and negatively charged groups. The immersion of the metal in a solvent with high dielectric constant favours the forces of repulsion, and metallic particles pass into solution until the osmotic pressure reaches the value defined by the electrolytic solution pressure. From these assumptions, the authors draw the conclusion that the order of magnitude of the electrolytic solution pressures of the metals must coincide with the order of the values of the expression $Q + a^2 n^2 m^2$, where Q is the heat of ionisation, n the valency, and m the atomic weight of the metal in question, whilst a^2 is a constant. Using Ostwald's data for Q (Abstr., 1893, ii, 357) and taking $a = 1/30$, the authors show that this conclusion is verified for the series Mg, Zn, Cd, Fe'', Tl, Co, Ni, Cu'', Hg', Ag. Lead, however, does not fall into its proper place between Ni and Cu.
J. C. P.

Decomposition Curves of Lithium Chloride in Alcohols and the Electro-deposition of Lithium. HARRISON E. PATTEN and WM. ROY MOTT (*J. Physical Chem.*, 1904, **8**, 153—195).—The electrolysis of solutions of lithium chloride in the following alcohols was studied: ethyl, propyl, butyl, amyl, and allyl alcohols, glycerol, and phenol. The solubility at 25° of the salt in these compounds in the order named is 2·475 per cent., 3·72 per cent., 9·56 per cent., 8·26 per cent., 4·20 per cent., 4·14 per cent., and 1·89 per cent. Aqueous solutions were first examined, and tables and curves are given showing the anode and cathode polarisation for various currents. In the alcohols there are three stages in the electrolysis: (1) that of the residual current where the dissolved gases depolarise the electrodes, (2) the formation of lithium alkyloxides, (3) deposition of lithium. In ethyl alcohol, no deposit of lithium was found until a very high current density (500 amperes per square foot) was reached, this being obtained by the use of a platinum wire as cathode. The metal appeared from solutions in propyl alcohol at a current density of about one-tenth that required for ethyl alcohol. In solutions in butyl alcohol, however, the deposition of lithium was readily obtained, the current density required being only about one-twentieth of that used in electrolytic copper refining. In amyl alcohol also, the lithium was deposited in considerable quantity, but in allyl alcohol and glycerol separation of lithium was not obtained. The authors discuss the conditions necessary for the electro-deposition of an alkali metal. It is evident that the rate of liberation must be greater than the rate of reaction between metal and solvent, and hence a solvent of slow action is essential. It must, however, possess also moderate solvent action and yield a fairly conducting solution in order that the necessary current density may be obtained. The single potential of lithium calculated from the polarisation values as well as from thermal data is 2·41 volts.

L. M. J.

Electric Osmose in Methyl Alcohol. A. Baudouin (*Compt. rend.*, 1904, **138**, 898—900).—Using Perrin's apparatus (compare Perrin, *Compt. rend.*, 1903, **136**, 1388, 1441), the author has shown that although the electric osmose in methyl alcohol is proportional to the difference of potential on the two sides of the porous septum, it requires a difference of potential of 250—300 volts in order to produce an effect comparable with that obtained by 60—100 volts in the case of water. The sign of the electric osmose varies with the nature of the porous septum, being in the contrary direction to the current in the case of chromium chloride, lead sulphate, or manganese dioxide, and in the same direction as the current in the case of silica, arsenic trisulphide, sulphur, or lead iodide. The addition of traces of an electrolyte diminishes the electric osmose or reverses its sign, whilst non-electrolytes, such as benzene, naphthalene, menthol, or camphor, have no effect. Finally, just as the addition of potassium hydroxide to water causes a positively charged septum to become negative, that is, reverses the sign of the electric osmose, so a septum of chromium chloride which is positively charged in contact with absolute methyl alcohol becomes negatively charged in a $N/1500$ solution of potassium methoxide. The analogous behaviour of acids is not so readily shown in the case of methyl alcohol owing to the esterification of the alcohol, but if added in sufficient quantity the sign of the osmose is reversed (compare Perrin, this vol., ii, 8). M. A. W.

Electric Resistance Thermometry at the Temperature of Boiling Hydrogen. James Dewar (*Proc. Roy. Soc.*, 1904, **73**, 244—251. Compare Abstr., 1901, ii, 308).—The following metals and alloys have been used in the experiments: platinum, gold, silver, copper, palladium, iron, nickel, platinum-rhodium, and German silver. It appears that the resistance of a pure metal diminishes regularly with temperature, approaching asymptotically to a definite value. Thus the parabolic connection between temperature and resistance is no longer valid at such low temperatures as the boiling point of hydrogen. Further evidence of this abnormal behaviour at low temperatures is found in the exceptionally high value (2·5) of the platinum thermometer constant δ, based on the resistances at 100°, 0°, and $-182·5°$ (compare the usual value $\delta = 1·5$, based on the resistances at 444·5°, 100°, and 0°). J. C. P.

Influence of the Change of Specific Heat on the Work done in a Transition. JACOBUS H. VAN'T HOFF (*Festschr. Ludwig Boltzmann*, 1904, 233—241).—When the change of specific heat accompanying a transition is taken into account (see Richards, *Proc. Amer. Acad.*, 1902, 293), the influence of temperature on the work done in the transition may be expressed by the following equation: $E = E_0 + AT - ST\log T$, where E is the free energy at the temperature T, E_0 that at absolute zero, S is the difference of the specific heats of the system before and after transition, A is an integration constant. From the above, it follows that $dE/dT = A - S(1 + \log T)$, and where the change or transition takes place without alteration of concentration, as in the case $Mg + ZnSO_4,aq = Zn + MgSO_4,aq$, $dE/dT = -S(1 + \log T)$. For 18°, this leads to $dE/dT = -6·7S$, and the author shows that this relationship is approximately fulfilled in a number of cases.

In the change of liquid $\longrightarrow$ solid, or in other transitions which take place at a definite temperature, A cannot be neglected, but further consideration of the equations shows that for the possibility of a transition of any kind S must be >0, that is, the form which is stable at higher temperatures must have the greater specific heat. This is known to be the case for every change liquid $\longrightarrow$ solid and for the majority of transition changes among elements or compounds exhibiting polymorphism. The exceptions among the latter may be due to incorrect determinations of the specific heats.

The equation given above permits also the general conclusions that at low temperatures those systems are stable the formation of which is accompanied by development of heat, whilst at high temperatures only those heat-absorbing reactions will take place which yield products with higher specific heat. J. C. P.

Specific Heats of Metals and the Relation of Specific Heat to Atomic Weight. III. WILLIAM A. TILDEN (*Proc. Roy. Soc.*, 1904, 73, 226—227. Compare Abstr., 1900, ii, 524; 1903, ii, 265).—The specific heats of the tellurides of tin, silver, and nickel, of two alloys of silver and aluminium, and of the elements involved in these have been determined over a wide range of temperature, amounting in most cases to about 700°. The molecular heat of each compound at successive temperatures is found to differ but slightly from the sum of the atomic heats of the component elements, and Neumann's law is therefore approximately true at all temperatures. It appears also that the specific heat of a solid is determined by the nature of the atoms composing the physical molecules, and is not a measure of the thermal work done in expansion. J. C. P.

Determination of the Heat of Combustion with the Calorimetric Bomb by Berthelot's Method. Pawel Zuboff (*J. Russ. Phys. Chem. Soc.*, 1904, **36**, 275—287).—The author discusses such questions as the necessity for the extreme purity of a substance, its freedom from isomerides, &c., the heat of combustion of which is to be determined, and, when liquids are investigated, the difficulty of preventing evaporation in the calorimetric bomb, &c. T. H. P.

Thermochemical Studies. Daniel Lagerlöf (*J. pr. Chem.*, 1904, [ii], **69**, 273—309).—A criticism of Thomsen's theory of the heat of formation of carbon compounds. G. Y.

Calculation of the Heats of Combustion of Organic Compounds containing Nitrogen. Paul Lemoult (*Compt. rend.*, 1904, **138**, 900—902. Compare Abstr., 1903, ii, 410; this vol., ii, 12).—By assigning to the group $\cdot\mathrm{C}\vdots\mathrm{N}$ the thermal value 16·5 Cal. and subtracting from it 10 Cal. for each group $\colon\mathrm{N}\cdot\mathrm{H}$, the molecular heat of formation of the compound $\mathrm{C}x\mathrm{H}y - a\mathrm{N}m\mathrm{H}a\mathrm{O}p$ is given by the expression $102x + 55/2y + 16{\cdot}5m - 10a - \Sigma p\phi$; ϕ having the value 55 Cal. for amides, imides, &c.

The molecular heats of combustion of a number of amines, amides, imides, nitriles, and compounds with nitrogen in the ring, calculated by means of the above formula, are given in the paper, and shown to agree closely with the experimental values. M. A. W.

Cyclic Amines. Paul Lemoult (*Compt. rend.*, 1904, **138**, 1037—1039).—The discrepancy between the experimental value for the heat of combustion of some amines and the value calculated from the formula (compare this vol., ii, 12 and preceding abstract), although negligible in the case of the secondary and tertiary amines, amounts to 22·6 Cal. in the case of some primary amines, and is probably to be attributed to some error in the experimental determination, for the author has determined the heats of combustion of xylidine [4-amino-1 : 3-xylene], ethylaniline, anisidine, and α- and β-naphthylamines, and finds that the experimental values agree very closely with those calculated by means of his formula. The molecular heat of combustion at constant volume of xylidine is 1111·42 Cal.; of ethylaniline, 1125·6 Cal.; of anisidine, 927·29 Cal.; of α-naphthylamine, 1268·78 Cal.; of β-naphthylamine, 1266·5 Cal. M. A. W.

Free Energy of Formation in Several Reactions of Technical Importance. Hanns von Jüptner (*Zeit. anorg. Chem.*, 1904, **39**, 49—68).—The author discusses the alteration of the free energy of a reaction with the temperature and brings forward an interpolation formula on the assumption that the alteration of free energy is a linear function of the absolute temperature, an assumption which could only be strictly correct if specific heats of substances were independent of temperature. The free energy of formation of steam, of carbon dioxide from carbon monoxide and oxygen, of carbon monoxide from amorphous carbon and oxygen, of carbon dioxide from amorphous carbon and oxygen, and of carbon monoxide from carbon and carbon dioxide are calculated. A. McK.

Determination of Melting Points. Léon Maquenne (*Bull. Soc. chim.*, 1904, **31**, 471—474).—The author states that Müther and Tollens' statement (this vol., i, 224) that in the determination of the melting point of hydrazones Maquenne's metal block process (*Bull. Soc. chim.*, 1887, **48**, 771) presents no advantage over the capillary tube method is only true when the block is slowly heated. In using the block, it should be rapidly heated and small portions (0·1 mg.) of the substance should be projected on to it. When the temperature is such that the substance melts instantaneously, this should be taken as the melting point. Under these conditions, phenylglucosazone melts instantaneously at 306° and leucine at 340°. These melting points are very different from those recorded for capillary tube determinations, in which case the melting point varies with the rate of heating.

T. A. H.

Freezing Points of Solutions as Steady Temperatures. K. Prytz (*Zeit. physikal. Chem.*, 1904, **47**, 729—732. Compare Abstr., 1902, ii, 382).—An apparatus constructed on the lines already laid down (*loc. cit.*) is sketched, and the procedure to be adopted in using it is described in detail. The apparatus has been used successfully not only with aqueous, but also with benzene, solutions.

J. C. P.

Course of the Decrease of Vapour Tension for Aqueous Solutions. Andreas Smits (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, **6**, 628—641).—The molecular rise of the boiling point for solutions of sodium chloride and potassium chloride respectively had been previously found by the author to have a minimum value at ± 0·3 gram-mol., whilst with various nitrates examined, the molecular rise of the boiling point decreased continually with increase of concentration. The diminution of the vapour tension of solutions of sodium chloride and nitrate respectively has now been determined by means of the micromanometer, where the aniline-water manometer was replaced by Lord Rayleigh's manometer (Abstr., 1901, ii, 542). The results obtained by both these manometers are concordant, and are contrasted with those obtained by Raoult and others by cryoscopic methods.

Solutions of sodium nitrate, which behave qualitatively in a normal manner, do not follow Ostwald's dilution law, whereas solutions of potassium nitrate do. A. McK.

High Temperature Gas Burner. Ludwig Hormuth (*Zeit. anal. Chem.*, 1904, **43**, 231).—By adding to an ordinary Bunsen burner an enlarged chamber for the admixture of the gas and air, the temperature of a blowpipe flame can be attained. M. J. S.

Ring Burner. LUDWIG HORMUTH (*Zeit. anal. Chem.*, 1904, 43, 231—232).—This is a ring-shaped tube with orifices within the ring. It can be attached to an ordinary Bunsen burner and then forms a support for the vessels which are to be heated. M. J. S.

Apparatus for Regulating the Pressure when Distilling under Reduced Pressure. JAN RUTTEN (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 6, 665—668).—An apparatus for regulating the pressure during vacuum distillation is illustrated and described.

A. McK.

Volume of Atoms and Molecules. ISIDOR TRAUBE (*Festschr. Ludwig Boltzmann*, 1904, 430—440).—A summary of the author's previous papers on this subject. J. C. P.

Atomic Volumes of the Rare Earths and their Significance for the Periodic Classification. CARL BENEDICKS (*Zeit. anorg. Chem.*, 1904, 39, 41—48).—The rare earths from lanthanum to ytterbium are brought together by the author into one grouping in the vertical rows III and IV of Mendeléeff's periodic classification; they are accordingly placed between barium and tantalum. A. McK.

Metric Standard of Volume. THEODORE W. RICHARDS (*J. Amer. Chem. Soc*, 1904, 26, 413—414).—A plea for the adoption of the millilitre as the standard of volume instead of the cubic centimetre, the former designation being more exact and less cumbrous than the latter. E. G.

New Pycnometer. S. BOŠNJAKOVIĆ (*Zeit. anal. Chem.*, 1904, 43, 230).—The thermometer which forms the stopper of the flask has a narrow tube fused into its stem parallel with the scale, and opening below into the flask, whilst terminating above in a small, stoppered funnel. M. J. S.

A New Pycnometer Pipette. E. FISCHER (*Chem. Zeit.*, 1904, 28, 359).—The author describes a pycnometer pipette which he has found convenient when small quantities of liquid are dealt with.

A. McK.

New Method of Determining Compressibility with Application to Bromine, Iodine, Chloroform, Bromoform. Carbon Tetrachloride. Phosphorus, Water, and Glass. THEODORE W. RICHARDS and WILFRED NEWSOME STULL (*J. Amer. Chem. Soc.*, 1904, 26, 399—412).—Methods of determining compressibility are described, which are applicable to nearly all substances. Two forms of apparatus have been devised, one for solids and the other for liquids. The first form consists of a short, wide, glass test-tube fitted with a well-ground, hollow stopper, which terminates above in a slender funnel tube provided with a platinum wire projecting downwards. The tube is filled with mercury, and the change in volume for different pressures is measured by placing it under the liquid in the barrel of a Cailletet compression apparatus, adding successive weighed portions of mercury, and noting on each occasion the pressure required to make and break the electrical contact between the platinum wire and the mercury. The substance, the compressibility of which is to be determined, is introduced beneath the mercury, and the experiment is repeated. The differences observed between the results of the two series of experiments represent the differences between the compression of the substance and that of an equal volume of mercury. Solids which attack mercury are surrounded with water, whilst liquids which attack mercury are enclosed in thin, flat, flexible glass bulbs. The decrease in volume of these bulbs on compression is determined as if they were homogeneous solids, and a correction is made for the change in volume of the mercury and glass.

In the apparatus employed for liquids which do not attack mercury, the funnel tube is replaced by a doubly-bent glass tube which contains the mercury necessary for making electrical contact. For details of these methods and the precautions to be observed in carrying out the experiments, the original must be consulted.

The compressibility of bromine, iodine, chloroform, carbon tetrachloride, bromoform, phosphorus, and water was determined by reference to mercury in most cases up to 500 or 600 atmospheres, and from the results were also obtained the value for glass and a qualitative indication of the compressibility of liquid chlorine; in each case, the temperature was maintained at 20°.

The "megabar," the pressure of a megadyne per sq. cm., is recommended as the most convenient unit of pressure; it is equal to 0·987 atmosphere. Expressing the pressures in terms of this unit, the average compressibilities, $\frac{\Delta V/V}{\Delta p}$, of the various substances between 100 and 200 atmospheres, compared with regard to their relative decrease with increasing pressure, are found to be as follows: iodine, 0·000013; bromine, 0·0000574; liquid chlorine, 0·00011; carbon tetrachloride, 0·0000883; chloroform, 0·0000881; bromoform, 0·0000467; water, 0·0000441; phosphorus, 0·0000208; glass, 0·00000231; mercury, 0·00000382 (Amagat).

Approximate determinations were made of the heat of compression of water and mercury, and a manometric method, based on the difference between the compressibility of water and mercury, is proposed for calibrating high pressure gauges. E. G.

[Law of the Rectilinear Diameter.] Alexius Batschinski (*Zeit. physikal. Chem.*, 1904, **47**, 743—744. Compare Abstr., 1903, ii, 10).—A reply to Bakker (this vol., ii, 310). J. C. P.

Contributions to the Knowledge of van der Waals' ψ-Surface. VIII. The ψ-Surface in the Neighbourhood of a Binary Mixture, which behaves as a Pure Substance. Jules E. Verschaffelt (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, **6**, 649—658).—A theoretical paper, which does not admit of being adequately abstracted. A. McK.

The Liquid State and the Equation of State. Johannes W. van der Waals (*Arch. Neer.*, 1904, 9, ii, 1—33).—The van der Waals equation, although qualitatively valuable, does not furnish results which are numerically exact. The author therefore discusses the question whether the constants a and b should not be regarded as temperature or pressure variables. Clausius had suggested that a should be replaced by $a.273/T$. The author raises objections to this, and considers that a is probably constant, but that b diminishes with the volume. Thus, for carbon dioxide the value of b has been found to be 0·00242 in the gaseous state, but 0·001565 in the liquid state; and he advances theoretical considerations which show that b must be regarded as a variable. The diminution in b may be regarded as due to a real decrease in the volume of the molecules themselves or to a variation of the relation existing between b and this volume. The equations relative to the vapour tension and compressibility are then considered. L. M. J.

Distribution of a Non-dissociating Substance between Two Solvents. G. Jäger (*Festschr. Ludwig Boltzmann*, 1904, 313—315). —A proof (based on the kinetic theory) of Nernst's proposition that the ratio of the concentrations of a non-dissociating substance in two immiscible solvents is independent of the absolute quantity of the substance dissolved. J. C. P.

Nature of Concentrated Solutions of Electrolytes. Hydrates in Solution. Harry C. Jones and Frederick H. Getman (*Amer. Chem. J.*, 1904, 31, 303—359).—The experiments described in this paper are a continuation of work previously recorded (Abstr., 1902, ii, 489; 1904, ii, 235). The freezing points, conductivity, and refractivity of solutions of the chlorides, sulphates, and nitrates of manganese, nickel, cobalt, copper, and aluminium have been determined. All these substances, except aluminium sulphate, in which case the proper dilution was not employed, showed a minimum value in the molecular depression of the freezing point. No sign of a minimum was exhibited by the conductivity and refractivity curves. Determinations have also been made of the molecular elevation of the boiling point produced by potassium iodide, sodium iodide, cadmium iodide, ammonium iodide, and sodium bromide. With the exception of sodium bromide, all these salts show a well-defined minimum in the molecular elevation, but this occurs at greater concentrations than the minimum in the corresponding freezing point curves.

It was suggested by Jones and Chambers (Abstr., 1900, ii, 262) that these phenomena may be explained by the theory that in concentrated solutions the dissolved substance combines with the solvent with formation of hydrates, which exist in the solution together with a small proportion of ions resulting from the electrolytic dissociation of the salt, and that those substances which yield crystals containing the largest amount of water of crystallisation would be expected to form the most complex hydrates in solution. The results obtained in the present investigation afford strong evidence that this interpretation is correct. The composition of the hydrates was calculated in those cases in which sufficient data had been obtained, and it was found that the hydrates decrease regularly in complexity with the dilution and disappear entirely at a dilution greater than that at which the freezing point minimum occurs.

E. G.

Effect of One Associated Solvent on the Association of Another Associated Solvent. HARRY C. JONES [and GRANTLAND MURRAY] (*Festschr. Ludwig Boltzmann*, 1904, 105—112).—The solvents studied were water, formic and acetic acids. The molecular weights of these three substances when dissolved up to fairly high concentrations in each of the other two have been determined by the freezing point method, and it is found that the association of the solute is in each case less than that of the same substance in the pure state. In other words, one associated liquid diminishes the association of another associated liquid, a result that has a direct bearing on Jones and Lindsay's observation that certain salts conduct better in pure methyl alcohol solution than in aqueous methyl alcohol solution (see Abstr., 1903, ii, 55). J. C. P.

Polymerisation of Organic Compounds in the Solid State. GEORGE G. LONGINESCU (*J. Chim. phys.*, 1903, i, 296—301).—The formula $(T/CD)^2 = n$, where T is the absolute melting point, D the density in the solid state, C a constant, and N the number of atoms in the molecule, is examined (compare Abstr., 1903, ii, 531; this vol., ii, 112), to see whether it is valid for solids as for liquids. For $C = 70$, a large number (66) of compounds such as citric acid, phthalic acid, aniline, nitrobenzene, &c., gave results approximately normal. Some (20), including acetic acid, formic acid, benzene, phenol, carbamide, &c., gave high values for n, indicating polymerisation. A number of compounds, however (16), gave low values for n; these include benzoic acid, azobenzene, glucose, and mannitol, although in the liquid state they give normal values. This would indicate dissociation, but the author considers that it is more probable that the value of C should be fixed at 50. The latter compounds would then be normal, but the majority of the compounds (those of the first set) would appear to be slightly polymerised. Further investigations are promised. L. M. J.

Polymerisation and Dissociating Power of Oximes. PAUL DUTOIT and ARTHUR FATH (*J. Chim. phys.*, 1903, i, 358—378).—The work of Ramsay, Guye, Beckmann, and others has indicated that, in general, the following classes of compounds are more or less polymerised in the liquid state: alcohols, phenols, aliphatic acids, aldehydes, nitriles, ketones, amines, urethanes, and thiocarbimides. Associated liquids are further generally characterised by a high latent heat of vaporisation, low surface tension and vapour pressure, whilst mixtures of associated liquids do not generally obey the simple mixture laws. They are also usually good solvents, and possess dissociative power (Abstr., 1897, ii, 546). The authors have therefore examined the relations between the polymerisation and dissociative power for a number of oximes, the following being employed: aldoxime, propaldoxime, *iso*valeraldoxime, œnanthaldoxime, acetoxime, methylpropylketoxime, and mesityl oxide oxime, and for these the paper contains the values obtained for capillarity, molecular refraction, densities at various temperatures, and viscosity. The surface tension for all these compounds indicates polymerisation, but the authors do not consider that quantitative measures of the association are given, especially as some of the compounds consisted of mixtures of the *syn-* and *anti-* varieties, the equilibrium of which may vary with temperature. Cryoscopic observations in benzene solution were also made, and in the case of acetoxime, methylpropylketoxime, and *iso*valeraldoxime association was indicated, although in acetic acid solution the two former compounds yielded normal values. In regard to their association, the oximes appear to occupy a place intermediate between the alcohols and acids on the one side, and the less abnormal liquids, as nitriles and aldehydes, on the other. The results of the work on the solvent and dissociative power are reserved for a later paper. L. M. J.

Surface Tension and Molecular Complexity of Active Homologous Compounds. Miss IDA HOMFRAY and PHILIPPE A. GUYE (*J. Chim. phys.*, 1904, i, 505—544).—A number of homologous series of optically active esters exhibit a maximum in the specific rotation; the molecular rotation in some of these series converges to a limiting constant value, in others this constant also passes through a maximum. This has been regarded by some chemists as due to the molecular disymmetry itself passing through a corresponding maximum, whilst by others it has been considered as due to the fact that the first members of the series in question are characterised by polymerisation or partial association (Frankland, Trans., 1899, 347). The authors have therefore investigated the polymerisation in those series which exhibit a maximum in the molecular rotation, employing the method of Ramsay and Shields. The results do not indicate association in any of the compounds examined, as the molecular surface energy was in almost all cases normal; the maximum is therefore not due to association. Some values for the constant were obtained which are higher than any previously found, reaching to above 3·6. The authors hence agree with Dutoit and Friderich that the value of K cannot be regarded as constant for all liquids, and that the linear nature of the temperature curve of the molecular surface energy is a better indication of normality. The higher values of K may be either due to the fact that the molecules are not spherical or it may indicate dissociation. Calculation of the number of atoms in the molecules of the compounds examined was also made by means of Longinescu's expression (Abstr., 1903, ii, 553; this vol., ii, 113), and in many cases indicates considerable dissociation. Freundler's observations are also in accord with this result (Abstr., 1896, ii, 531). L. M. J.

Solid Solutions and Isomorphism. GIUSEPPE BRUNI and MAURICE PADOA (*Gazzetta*, 1904, **34**, i, 133—143).—In view of the fact that nitro-compounds are often isomorphous with the corresponding halogen compounds, the authors have made a series of cryoscopic determinations with such derivatives, the following being the conclusions drawn from the results obtained. On dissolving a nitro-compound in the corresponding chloro-, bromo-, or iodo-derivative, a solid solution is generally obtained exhibiting very anomalous cryoscopic behaviour. If, however, the halogen compound is dissolved in the nitro-derivative, either slightly abnormal or normal cryoscopic behaviour is observed. The nitro-group must hence be placed in the isomorphogenous group containing the halogens and cyanogens.

T. H. P.

[Phase Rule.] RUDOLF WEGSCHEIDER (*Zeit. physikal. Chem.*, 1904, **47**, 740—742).—A reply to Byk (this vol., ii, 313). J. C. P.

Chemical Equilibrium and Fall of Temperature. WALTHER NERNST (*Festschr. Ludwig Boltzmann*, 1904, 904—915).—The author reduces to mathematical formulæ the influence of a temperature gradient on the equilibrium of a chemical system. The phenomena of which the theory is here given are, for example, those observed in Deville's experiments with a hot-cold tube, but the experimental data by which the author's deductions are quantitatively tested are those referring to the thermal conductivity of nitrogen peroxide, a dissociating gas (see Magnanini and Malagnini, Abstr., 1898, ii, 282; Magnanini and Zunino, Abstr., 1900, ii, 525. Compare also Swart, Abstr., 1891, 780). It is possible, with the author's formulæ, to calculate the thermal conductivity of nitrogen peroxide at various temperatures in good agreement with the experimental values.

J. C. P.

Equilibrium of a Solid with a Liquid Phase, chiefly in the Vicinity of the Critical State. JOHANNES D. VAN DER WAALS (*Arch. Neer.*, 1904, **9**, ii, 158—185).—A paper largely mathematical and illustrated by numerous diagrams essential to its comprehension. An interesting point obtained is that in such equilibrium the phenomena of "retrograde solidification" should be frequently found, both by pressure change at constant temperature and by temperature change at constant pressure. L. M. J.

Equilibria in the System $NH_4NO_3 + AgNO_3$. JAN VON ZAWIDZKI (*Zeit. physikal. Chem.*, 1904, **47**, 721—728).—When silver nitrate is added to ammonium nitrate, the freezing point of the latter is lowered ultimately to a eutectic temperature 101·5°. This is followed by an intermediate branch of the freezing point curve which has its summit at 109·6° and 50 molecular per cent., thus corresponding with the formation and separation of the compound, $NH_4NO_3,AgNO_3$. A second eutectic point lies just beyond the summit, and thence the freezing point curve rises regularly to the freezing point of silver nitrate. The study of the freezing point phenomena has shown that no mixed crystals are formed, and this is confirmed by a determination of the transition points of ammonium nitrate and silver nitrate. The three transition points of ammonium nitrate lie at the same temperature levels (namely, 125·0°, 85·4°, and 35·0°) whatever the admixture of silver nitrate. A similar remark applies to the transition point of silver nitrate at 159·6°. The determinations of these various transition points have been made thermometrically, and agree well with those made by earlier investigators. It is noted that the first branch of the freezing point curve shows a slight break at 125°, the highest transition point of ammonium nitrate. J. C. P.

The Apparent Diminution of the Energy of a Weak Acid in the presence of one of its Normal Salts. GABRIEL CHESNAU (*Compt. rend.*, 1904, 138, 968—970).—The author has made a series of experiments on the influence of sodium acetate in promoting the precipitation of the sulphides of the metals of the iron group by hydrogen sulphide in the presence of acetic acid, and finds that it is the formation of an alkali sulphide by the action of hydrogen sulphide on sodium acetate even in the presence of free acetic acid which is the cause of the more or less complete precipitation of metallic sulphides in the presence of sodium acetate, which are not precipitated in the presence of acetic acid only, for a mixture of sodium acetate and hydrogen sulphide gives with sodium nitroprusside the purple colour characteristic of alkali sulphides, and the addition of increasing proportions of acetic acid retards, but does not suppress, this reaction. M. A. W.

Velocity of Crystallisation of Isomorphous Mixtures. MAURICE PADOA (*Atti R. Accad. Lincei*, 1904, 13, i, 329—337).—The author has studied the alteration produced in the velocities of crystallisation of azobenzene, phenylpropionic acid, *a*-naphthylamine, dibenzyl, phenanthrene, tribromophenol, *m*-bromonitrobenzene, and bromocamphor by the addition of various compounds, including some which are isomorphous with those just named. The results show that the addition to a substance of substances which form solid solutions with it diminishes the velocity of crystallisation either not at all or only slightly. This may be employed as a convenient means of detecting isomorphism, as only small quantities of material are required. The addition of isomorphous substances to a compound does not exert any characteristic action on the formation of nuclei in the crystallisation. T. H. P.

Catalytic Action of Platinum Black. RUDOLF VONDRÁČEK (*Zeit. anorg. Chem.*, 1904, 39, 24—40).—The various hypotheses respecting the catalytic action of platinum black, submitted by Bredig, Haber, and others, are mentioned. The author has examined the action of platinum black in promoting the decomposition of ammonium nitrate into nitrogen and water. A mixture of equivalent amounts of potassium nitrite and ammonium chloride in aqueous solution was used. The rate of decomposition is proportional to the quantity of platinum present when the solutions are not too concentrated, and it increases with increase of temperature.

There are two forms of platinum black, one of which contains oxygen and the other does not; the former can act as an oxidising and the latter as a reducing agent. It is shown that the former variety can oxidise solutions of ammonia and ammonium salts with evolution of nitrogen, whilst the latter variety can reduce solutions of nitrous and nitric acids respectively, and, in so doing, is converted into the former variety. The same conversion can also be effected by atmospheric oxygen. When platinum black is left in contact with ammonium salts, it absorbs nitrogen, which is liberated by the action of aqueous potassium hydroxide solution. The decomposition of ammonium nitrite by platinum black proceeds in two stages: firstly, the platinum black, which, to begin with, contains oxygen, oxidises the ammonium nitrite, thus: $2NH_4NO_2 + xPtO_n + yH_2O = N_2 + 2HNO_2 + xPt + (y+3)H_2O$, and, secondly, the nitrous acid formed in the first stage is reduced by the platinum, which is now oxygen-free, thus: $2HNO_2 + xPt = N_2 + H_2O + xPtO_n$.

The catalytic action of platinum black on a mixture of hydrogen and oxygen is analogous; the platinum black is alternately reduced by hydrogen and oxidised by oxygen.

When ethyl alcohol was boiled with an aqueous solution of potassium chlorate in presence of platinum black, the chlorate was reduced, but there was no reduction in the absence of platinum. A similar reduction of chlorate took place when dextrose was oxidised by potassium chlorate in presence of platinum black. A. McK.

Inversion of Sucrose induced by the Platinum Metals. Franz Plzák and B. Hušek (*Zeit. physikal. Chem.*, 1904, 47, 733—739. Compare Šulc, Abstr., 1900, ii, 395).—Palladium powder, as usually obtained, markedly retards the inversion of sucrose by acids (compare Šulc, *loc. cit.*). This effect, however, is due to the presence of some foreign metal, probably zinc, and pure palladium actually accelerates the inversion of sucrose. The efficiency of palladium in inducing the sucrose inversion increases with the length of time for which it has been dried at 100°, an observation pointing to the oxide as the probable cause of inversion. When the palladium has been previously ignited in the air, its accelerating effect is slight until about three hours have elapsed. The catalytic efficiency of platinum is greater, that of iridium is less, than that of palladium under similar conditions.

J. C. P.

Rapid Methods for the Physico-chemical Analysis of Physiological Liquids. Philippe A. Guye and Stefan Bogdan (*J. Chim. phys.*, 1903, i, 379—390).—The paper contains first an account of some modifications of customary apparatus to enable the constants of viscosity, conductivity, and cryoscopic depression to be determined speedily and with only a small quantity of liquid. The authors then describe the results of some experiments with normal and pathological urine, in which very great differences in the actual values of the physical constants and in the values per gram of dissolved matter are seen to exist. Variations in the physical constants are also found to ensue after the lapse of 12 hours, although no differences could be detected by analysis. They consider that the determination of such physical constants will be of great service in pathology, and further experiments are in progress. L. M. J.

Bibliography of Colloids. Arthur Müller (*Zeit. anorg. Chem.*, 1904, **39**, 121—151).—The literature in connection with colloids is embraced in the 356 publications which are enumerated.

A. McK.

Theory of Dyeing. I. Behaviour of Inorganic Colloids towards the Fibre. Wilhelm Biltz (*Ber.*, 1904, **37**, 1766—1775).—It is demonstrated that inorganic colloids are more or less absorbed from solution by cotton yarn, wool, and especially silk, independently of the chemical nature of the dissolved colloids. The theory of dyeing is discussed at length, but for this the original should be consulted.

E. F. A.

Inorganic Chemistry.

The Atomic Weights of Oxygen and Hydrogen and the Probable Value of an Atomic Ratio. Philippe A. Guye and Edouard Mallet (*Compt. rend.*, 1904, **138**, 1034—1037).—The arithmetic means of the values obtained by Morley for the atomic weight of oxygen ($H=1$) by three direct and independent methods are (1) 15·8791, from the ratio $O:H_2$; (2) 15·8785, from the ratio $H_2O:H_2$; (3) 15·8784, from the densities and volume ratio; and the difference between the two extreme values is 0·0007; if, however, Vallier's correction be applied to the arithmetic means, the numbers become 15·8789, 15·8786, and 15·8786 respectively, with a difference of 0·0003 between the extreme values, and the final value is $O=15·8787$ for $H=1$, or $H=1·00764$ for $O=16$.

M. A. W.

Composition of Double Halogen Salts. Horace L. Wells (*Amer. Chem. J.*, 1904, **31**, 395—398. Compare Abstr., 1902, ii, 11).—A criticism of Ephraim's generalisations (Abstr., 1903, ii, 418, 538, 552) relating to the formation of double halogen salts (compare also Grossmann, Abstr., 1903, ii, 476; and Pfeiffer, Abstr., 1903, ii, 596).

E. G.

Solubility of Atmospheric Oxygen in Sea-water and in Water of Different Degrees of Salinity. Frank Clowes and J. W. H. Biggs (*J. Soc. Chem. Ind.*, 1904, **23**, 358—359).—Since determinations of the solubility of atmospheric oxygen in waters intermediate in salinity between distilled water and sea-water have not previously been made, results are recorded with samples of mixtures of distilled water and sea-water with the view of establishing standard percentages of aëration for estuary waters of varying salinity. Winkler's method was employed.

The amount of oxygen dissolved in sea-water gradually increases when the particular sample is repeatedly shaken with air at intervals of some days. The maximum power of solution is accordingly attained only when the deoxidising agents, which are presumably present, are removed. The extent to which this deoxidation occurs is indicated by the tabulated results. The amount of chlorine in each sample is also quoted.

The solubility of atmospheric oxygen diminishes regularly in proportion to the amount of sea-water present. The sodium chloride in sea-water is the particular constituent which determines the amount of atmospheric oxygen dissolved. A. McK.

Physical Constants at Low Temperatures. I. Densities of Solid Oxygen, Nitrogen, Hydrogen, &c. James Dewar (*Proc. Roy. Soc.*, 1904, 73, 251—261).—The densities have been calculated from the volume of gas which, when liquefied or solidified, just filled a cooled bulb of known capacity. The results obtained are summarised in the following table :

	Densities.		
Temp.	Oxygen.	Nitrogen.	Hydrogen.
– 182·5°	1·1181	—	—
– 195·5	1·1700	0·8042	—
– 210·5	1·2386	0·8792	—
– 252·5	1·4256	1·0265	0·0700
– 258·3	—	—	0·0754
– 259·9	—	—	0·0763

With the help of these densities, the author has constructed Mathias' rectilinear diameters for oxygen, nitrogen, and hydrogen respectively, and shows that the values thence deduced for the critical densities of these gases agree well with those arrived at by other observers. With these rectilinear diameters, it is also possible to calculate the molecular volumes at absolute zero, the vapour density being neglected, and the author accordingly finds 21·21, 25·49, and 24·18 as the molecular volumes at – 273° of oxygen, nitrogen, and hydrogen respectively. J. C. P.

Calorimetric Measurements with Liquid Oxygen and Liquid Nitrogen. Heinrich Alt (*Ann. Physik*, 1904, [iv], 13, 1010—1027).—The latent heat of vaporisation r has been determined at a number of temperatures for liquid oxygen and liquid nitrogen by supplying electrically a known amount of heat to the liquid and finding the corresponding loss of weight of the latter. Allowance is, of course, made for the normal loss due to conduction of heat from the surroundings. In the case of oxygen, the value of r at the boiling point (– 182·4°) is 52·02 ± 0·15 cal. ; under reduced pressures and at correspondingly lower temperatures, r increases, especially at the lowest temperatures, until at – 201·3° it has a value about 59·0 cal. The latent heat of vaporisation of nitrogen has at its own boiling point (– 195·67°) the value 48·58 ± 0·18 cal., increases in a linear manner as the temperature of vaporisation is lowered, and at – 210° has the value 52·06 cal.

With the same apparatus, by supplying electrically the heat necessary to raise the liquid from the boiling point under a low pressure to the boiling point under atmospheric pressure, the author has determined the mean specific heats of liquid oxygen and liquid nitrogen. The values found are: for oxygen, 0·347 ± 0·014 (temperature range $-200°$ to $-183°$); for nitrogen, 0·430 ± 0·008 (temperature range $-208°$ to $-196°$), the same value as that obtained by Dewar.

J. C. P.

Production of Active Oxygen and the Hypothesis of Electrons. WILLEM P. JORISSEN (*Chem. Centr.*, 1904, i, 1055—1056; from *Chem. Weekblad.*, 1, 337—342. Compare Abstr., 1897, ii, 253).—Experiments made with an apparatus similar to that used by Helmholtz and Richarz have shown that triethylphosphine, benzaldehyde, oil of turpentine, and a strong solution of sodium sulphite tend to condense water vapour; radium bromide and a 30 per cent. solution of hydrogen peroxide also have a similar effect. A photographic plate in a light tight case was found to be affected by phosphorus which was undergoing spontaneous oxidation.

E. W. W.

Melting Point Lines of the System, Sulphur + Chlorine. H. W. BAKHUIS ROOZEBOOM and A. H. W. ATEN (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 6, 599—605. Compare Abstr., 1903, ii, 634).—The equilibrium between S_2Cl_2, SCl_2, SCl_4, and Cl_2 is not changed when the liquid mixture is cooled below 0° to temperatures at which a solid phase separates. Mixtures containing 50—100 per cent. of sulphur behave like mixtures of the type $S_2Cl_2 + S$. The solubility of sulphur in sulphur chloride is very slight at low temperatures. The results are represented graphically. The true melting point of sulphur tetrachloride is not known; the crystals of sulphur tetrachloride, when rapidly heated, are quite permanent up to $-20°$.

A. McK.

Influence of Hydriodic Acid on the Oxidation of Sulphurous Acid. ARMAND BERG (*Compt. rend.*, 1904, 138, 907—909. Compare Abstr., 1903, ii, 179).—Comparable experiments made on the rate of oxidation of sulphurous acid in the presence of air, with and without the addition of hydriodic acid, show that for each strength of sulphurous acid there is a certain limiting proportion of hydriodic acid which has no influence on the oxidation of the former, but that the hydriodic acid has a retarding or accelerating effect according as it is present in proportions less or greater than this limit. For a 4 per cent. solution of sulphurous acid, this limiting value of the hydriodic acid solution is 3 per cent., which corresponds with about $1HI$ to $3H_2SO_3$, whilst for the same strength of sulphurous acid the amounts of oxygen absorbed (1) by the sulphurous acid alone, (2) in the presence of 0·36 per cent. of hydriodic acid, (3) in the presence of 36·5 per cent. of hydriodic acid, are as 8 : 1 : 89·5.

Manganous chloride, ferrous chloride, or solutions of the metallic iodides behave similarly to hydriodic acid in accelerating the oxidation

of sulphurous acid, whilst potassium chloride or bromide has no action, and hydrochloric acid retards the oxidation, and even stops it altogether.
M. A. W.

Electrolytic Oxidation of Sodium Thiosulphate and the Mechanism of the Process. C. J. Thatcher (*Zeit. physikal. Chem.*, 1904, **47**, 641—720).—When sodium thiosulphate is oxidised electrolytically at a platinised electrode, tetrathionate alone is produced if the solution remains neutral or very faintly alkaline. If the solution is, or becomes, acid or strongly alkaline, other reactions take place, resulting in the formation of sulphur, sulphite, and sulphate. That sulphate is formed in a strongly alkaline solution is probably due to the presence of trithionate, which, along with thiosulphate, is produced by the hydrolysis of tetrathionate under these conditions; the trithionate so formed is then oxidised to sulphate. Sodium tetrathionate itself cannot be further oxidised either in neutral or acid solutions.

The electrolytic oxidation of thiosulphate to tetrathionate, which takes place with an anode potential difference of from $-0·75$ to $-0·95$ volt, is regarded not as resulting from direct electrolytic action ($2S_2O_3'' + 2F = S_4O_6''$), but as being a secondary chemical process brought about by some oxidising agent (probably oxygen) which is itself primarily formed in the electrolysis. This chemical oxidation is accelerated by the platinised electrode, for if the platinum is clean and bright, the amount of oxidation for the same amount of electricity is much smaller. That the oxidation of thiosulphate is an indirect process is deduced firstly from a study of the variation of the potential-current curves with the concentration of the various ions involved (compare Cottrell, Abstr., 1903, ii, 258); by this means, it is shown that hydroxyl or oxygen ions are discharged at the electrode. Further, the influence of certain non-dissociated "poisons," such as mercuric cyanide, on the potential difference between platinum and thiosulphate solutions shows that in the process $S_2O_3'' \longrightarrow S_4O_6''$ oxygen or some compound of oxygen is involved, and that the metal of the electrode acts catalytically. In view of these results, the mechanism of the electrolytic oxidation of thiosulphate may be represented as follows:

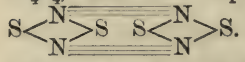
$$O'' + 2F = \tfrac{1}{2}O_2$$
$$2S_2O_3'' + \tfrac{1}{2}O_2 = S_4O_6'' + O''.$$

J. C. P.

Density of Nitrogen at the Temperature of Liquid Air, and its Relation to the Pressure. A. Bestelmeyer and Siegfried Valentiner (*Sitzungsber. K. Akad. München*, 1903, 743—755).—Density determinations have been carried out at temperatures between 81° and 85° absolute, and under pressures varying from 160 to 1320 mm. of mercury. With the help of a coefficient of expansion, the observations have been reduced to the two temperatures 81·4° and 85° absolute. At each temperature, the product *pv* diminishes as *p* increases, the relation between these two quantities being a linear one.
J. C. P.

Influence of Pressure on the Ratio c_p/c_v for Nitrogen at the Temperature of Liquid Air. SIEGFRIED VALENTINER (*Sitzungsber. K. Akad. München*, 1903, 691—741).—At the temperature of liquid air, the ratio of the specific heats of nitrogen increases with the pressure to the extent of 5 per cent. over a range of 2 atmospheres. It is very probable that the value of the ratio at the temperature of liquid air and low pressures is the same as the value at the ordinary temperature and atmospheric pressure. J. C. P.

Solubility of Nitrogen in Liquid Oxygen. ALFRED STOCK (*Ber.*, 1904, 37, 1432—1434).—A criticism of Erdmann and Bedford's paper (this vol., ii, 328). G. Y.

Constitution of Nitrogen Sulphide. OTTO RUFF and EMIL GEISEL (*Ber.*, 1904, 37, 1573—1595).—Nitrogen sulphide has been shown by Schenck (Abstr., 1896, i, 426) to have the molecular formula N_4S_4, and was represented by him by the structural formula  $S<\begin{smallmatrix}N\\N\end{smallmatrix}>S\quad S<\begin{smallmatrix}N\\N\end{smallmatrix}>S$. The researches of Ruff on sulphur haloids (Abstr., 1903, ii, 204, 590) render the bivalence of sulphur in this and similar compounds improbable.

Nitrogen sulphide is best prepared by Schenck's method, and the relation of the yield to the composition of the sulphur chloride employed indicates that it is the sulphur tetrachloride present which is concerned in the reaction: $12SCl_4 + 16NH_3 = 3S_4N_4 + 48HCl + 2N_2$.

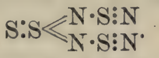
Dry hydrogen chloride reacts with nitrogen sulphide according to the equation $N_4S_4 + 12HCl = 4NH_3 + 4S + 12Cl$, no free nitrogen being produced.

Nitrogen sulphide dissolves in liquid anhydrous ammonia at $-40°$ to a red solution, and on evaporation of the ammonia an orange or brown powder remains, containing up to 2 mols. of NH_3, but dissociating slowly, even at the ordinary temperature. Solutions of metallic iodides in anhydrous ammonia form precipitates with the nitrogen sulphide. Lead iodide forms *lead dithiodi-imide*, PbN_2S_2,NH_3, crystallising in olive-green prisms, becoming orange in air without alteration of weight, decomposing when slowly heated, and exploding very violently at 140° when rapidly heated. Hydrogen chloride reacts quantitatively according to the equation $PbN_2S_2,NH_3 + 6HCl = PbCl_2 + 3NH_3 + 2S + 4Cl$. Dry liquid hydrogen sulphide reacts thus: $PbN_2S_2,NH_3 + 3H_2S = PbS + 4S + 3NH_3$. Ethyl iodide forms ethyl sulphide and lead iodide.

Mercury thiodi-imide, HgN_2S,NH_3, prepared in similar manner from mercuric iodide, forms bright yellow crystals and resembles the lead compound, but contains one atom of sulphur less. The addition of lead iodide to the filtrate from the mercury compound produces a precipitate of lead dithiodi-imide, and, conversely, mercuric iodide precipitates mercury thiodi-imide from the filtrate from the lead compound. Definite compounds could not be obtained from other metallic iodides.

Water hydrolyses nitrogen sulphide, forming sulphuric, sulphurous, thiosulphuric, and trithionic acids. Alkalis form only sulphurous and thiosulphuric acids with small quantities of hydrogen sulphide and perhaps of dithionic acid.

The most probable constitution for nitrogen sulphide is



$$S{:}S<\begin{matrix}N\cdot S{:}N\\ N\cdot S{:}N\end{matrix}$$

The compound with ammonia may be assumed to dissociate in anhydrous ammonia solution into $N{:}S\cdot NH_2$ and $S{:}S(NH)_2$, of which the former yields an insoluble mercuric salt, $N{:}S\cdot NHg$, and the latter an insoluble lead salt, $S{:}S<\begin{matrix}N\\N\end{matrix}>Pb$. C. H. D.

Graphitic Acid or Oxide. Frederic S. Hyde (*J. Soc. Chem. Ind.*, 1904, 23, 300—302).—The various methods of preparing graphitic acid are discussed. The author modifies Fitzgerald's method by carrying out the oxidation of graphite with a mixture of concentrated sulphuric and nitric acids and potassium chlorate at 60° instead of by heating over the water-bath, as Fitzgerald does. Ceylon graphite produces the best results; the grass-green oxide initially formed is more readily produced than with artificial graphite, whilst with ordinary coke, charcoal, or carbon black it is not formed at all.

A. McK.

Carbides and Silicides. A General Method for the Determination of Carbon in Carbides. Walther Hempel [and Paul Rucktäschel] (*Zeit. angew. Chem.*, 1904, 17, 296—301, 321—325).—The author now publishes an account of Rucktäschel's experiments (*Inaug. Diss. Rostock*, 1892), since they are of interest as being an extension of Moissan's researches.

Details of the preparation and properties of various carbides are given. Carbides of iron, containing 1·84, 2·37, 3·02, 2·34, 3·13, 4·01, and 4·96 per cent. of carbon respectively, were prepared in the electric furnace. With cobalt, alloys were prepared containing 0·44, 0·62, 1·87, 1·88, 2·65, 2·80, 6·47, and 8·45 per cent. of carbon respectively, and with nickel, alloys containing 1·71, 2·14, 4·69, and 6·25 per cent. of carbon respectively. In the nickel alloys, the carbon is in the state of mechanical admixture, whilst in the iron and cobalt alloys a large proportion of the carbon is chemically combined with the metal. An alloy of platinum, containing 1·2 per cent. of carbon, was prepared. Copper formed an alloy containing 0·03 per cent. of carbon; manganese, silver, gold, chromium, and tungsten formed alloys containing 0·47, 0·04, 0·31, 2·23, and 3·3 per cent. of carbon respectively.

Alloys of silicon and cobalt, containing 2·70, 11·6, and 19·3 per cent. of silicon respectively, were prepared by fusing a mixture of reduced cobalt and of powdered silicon which had been crystallised from zinc. Alloys of silicon and nickel, containing 3·5, 13, and 19·95 per cent., alloys of silicon, carbon, and cobalt, and alloys of silicon, carbon, and nickel, were prepared.

The amount of carbon was estimated by Weyl's method. In the case of those metals which were insoluble in the commoner mineral acids, the alloy was heated in a sealed tube with almost the theoretical amount of aqua regia. A. McK.

Action of Silicon on Water at a Temperature of about 100°. HENRI MOISSAN and F. SIEMENS (*Compt. rend.*, 1904, **138**, 939—941).—When pure amorphous or crystalline silicon in a fine state of division is kept in a glass vessel in contact with distilled water at a temperature of about 95° for 6 to 12 hours, each particle of silicon becomes coated with hydroxide, which can be detected by Vigouroux's method (compare Abstr., 1895, ii, 447) and confirmed by analysis, and at the same time bubbles of gas are given off which consist of hydrogen and a little air. This apparent decomposition of water by silicon is, however, due to traces of alkali furnished by the glass, which reacts with the silicon to form a soluble silicate with the liberation of hydrogen, for if the glass vessel is replaced by one of platinum and the water is distilled from a platinum retort, or if the glass vessel is used and a trace of hydrofluoric acid added to the water, the silicon remains unchanged and no gas is evolved; whilst the addition of a drop of alkali to the distilled water in the platinum vessel causes the decomposition to proceed as in the first case. Using a fused quartz vessel and water distilled from a platinum retort the silicon is not attacked.

These experiments show the importance of the warning issued by the International Commission on Atomic Weights against the use of glass vessels for exact analytical work. M. A. W.

Synthesis of Silicon Hydride, SiH_4, from the Elements. A. DUFOUR (*Compt. rend.*, 1904, **138**, 1040—1042).—When pure hydrogen prepared by electrolysis, freed from oxygen by passing it through a silica tube heated to redness, and from moisture by cooling it in liquid air, is passed over silicon heated to above its fusing point by means of an electric arc or an oxyhydrogen blowpipe flame, the two combine to a slight extent, and silicon hydride can be detected in the escaping gases by the formation of a black precipitate with silver nitrate, of a reddish-brown precipitate with copper sulphate, and of silica capillaries when the gas is allowed to bubble through water. The product was identified with the hydride SiH_4 by cooling the mixed gases in liquid air under a pressure of 20 atmospheres in a special apparatus; by this means a small drop of limpid liquid was obtained, the boiling point of which, as determined by a thermoelectric couple, was found to be $-114°$ under 750 mm. pressure. The boiling point of silicon hydride, SiH_4, prepared from magnesium silicide by the action of hydrochloric acid (compare Moissan and Smiles, Abstr., 1902, ii, 318), is $-115°$ to $-116°$ under 730 mm. pressure. M. A. W.

Reduction of Silica by Hydrogen. A. DUFOUR (*Compt. rend.*, 1904, **138**, 1101—1103).—When a current of hydrogen is passed through a silica tube heated to softness by an oxyhydrogen blowpipe flame, a deposit of silicon and silica or of silica only is formed on the inside of the tube, due to the reduction of the silica by the hydrogen at the high temperature with the formation of silicon hydride and water vapour, and at a slightly lower temperature the reverse reaction in which silica and hydrogen are formed. When the reverse reaction is incomplete, part of the silicon hydride is decomposed yielding silicon and hydrogen, which accounts for the mixed deposit of silicon and silica. If a rod of silica be heated to softness in an oxyhydrogen blowpipe flame, it loses in weight, a rod weighing 970 mg. losing 500 mg. in 15 minutes.

Against the view that these phenomena can be explained by the volatility of the silica and its partial dissociation under the conditions of the experiment, the author advances the following facts: (1) silica is not appreciably volatile at the temperature of the experiment (compare Moissan, Abstr., 1893, ii, 532. Compare, however, Moissan, Abstr., this vol., ii, 256); (2) when, in the first experiment, the hydrogen is replaced by oxygen or carbon monoxide, no deposit is formed in the tube; (3) in the second experiment, the loss in weight of the silica rod varies with the nature of the gas employed as a source of heat, being greatest for a mixture of oxygen and hydrogen, less for a mixture of oxygen and coal gas, and least for a mixture of oxygen and carbonic oxide; (4) if a current of nitrogen is passed through a heated quartz tube, no deposit is formed, showing that there is no tendency for the silica to dissociate at that temperature. M. A. W.

Experiments on the Light Phenomena caused by Ozone and by Radium. FRANZ RICHARZ and RUDOLF SCHENK (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 13, 490—493. Compare this vol., ii, 154).—The illuminating effect caused by the action of ozone on zinc blende is contrasted with that caused by radium in an atmosphere of air or of oxygen. Ozone formation occurs even with feebly radioactive specimens of radium bromide in an atmosphere of oxygen. Since ozone causes zinc blende to luminesce, it follows that part of the luminescence undergone by zinc blende under the influence of radium in the presence of air must be due to ozone. An experiment is described to show that the fluorescence of zinc blende in the presence of radium in an atmosphere of dry carbon dioxide is not so marked as when dry air is substituted for carbon dioxide. Barium platinocyanide, which does not luminesce in ozone, luminesces under the influence of radium to the same extent in air and in carbon dioxide. The luminescence of zinc blende caused by ozone is regarded as an oxidation phenomenon.

Other substances, for instance, red phosphorus and turpentine, are also found to behave like zinc blende towards ozone. A. McK.

Electrolytic Enriching of Radium from Radium-Barium Preparations. EDGAR WEDEKIND (*Chem. Zeit.*, 1904, 28, 269—270).—Radium-barium chloride, freshly prepared from crude radium-barium carbonate, was electrolysed, the cathode being mercury and the anode platinum. The amalgam, formed at the beginning of the electrolysis, was more strongly radioactive than that subsequently formed.

A. McK.

Radioactivity in relation to the Presence of Helium. RAFFAELO NASINI (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 217—218).—The mud and waters of Abano (compare Nasini and Anderlini, Abstr., 1894, ii, 422; with Salvadori, Abstr., 1898, ii, 527), when acidified with hydrochloric acid, give with barium chloride a precipitate which is strongly radioactive; a much less active substance, however, is obtained on precipitating the same solution with sulphuric acid. The mud of Abano is much more radioactive than that of Battaglia; detritus obtained from the *soffioni* of Larderello is also active. Barium sulphate obtained from a Vesuvian rock containing both helium and barium possesses a high activity. W. A. D.

Action of Sodium Amalgam on Solutions of Potassium Salts and of Potassium Amalgams on Solutions of Sodium Salts. G. McPhail Smith (*J. Physical Chem.*, 1904, 8, 208—213).—The retarding effect of solutions of potassium and sodium salts on the action of sodium and potassium amalgams on water was considered by Fernekes (this vol., ii, 163) to be opposed to the ionic theory—for although the effect of sodium salts on the action of sodium amalgam is explicable, that of potassium salts is not. The author shows that the facts are not opposed to the ionic theory, inasmuch as the first action may be regarded as between the potassium ions of the solution and the sodium atoms of the amalgam until equilibrium is reached, in accordance with the mass action law, when the sodium-potassium amalgam reacts with the water. Experiments show that when a sodium amalgam is placed in a solution of a potassium salt a mixed amalgam is soon formed, and the same holds for a potassium amalgam placed in a solution of a sodium salt. This principle is, further, the basis of the preparation of various amalgams. L. M. J.

Solubility of Acid Nitrates. Erich Groschuff (*Ber.*, 1904, 37, 1486—1493).—Ammonium trinitrate, $NO_3NH_4,2NO_3H$, crystallises in prismatic needles melting at 29—30°; the labile dinitrate, NO_3NH_4,NO_3H, forms irregular hexagonal platelets. The solubility of these compounds in nitric acid at various temperatures has been determined. Potassium trinitrate crystallises in prisms melting at 22°; *potassium dinitrate*, NO_3K,NO_3H, crystallises in plates, forms a eutectic mixture with the trinitrate melting at 22°, and at 29° decomposes into the normal salt and an acid solution. Curves are plotted showing the behaviour of these salts towards nitric acid and water, and the results are discussed from the standpoint of the equilibrium theory. E. F. A.

Action of Silica on the Melting of Alkali Carbonates. Nicolaus M. von Wittorf (*Zeit. anorg. Chem.*, 1904, 39, 187—196).—Mallard showed that the quantity of carbon dioxide evolved by the action of silicon dioxide on an excess of molten sodium carbonate increases with rise of temperature and finally reaches a limit in cases where the amount of carbon dioxide is less than that corresponding to the formation of an orthosilicate, $2Na_2O,SiO_2$, in the molten mass (this Journ., 1873, 135, 243). The author has examined the equilibrium between carbon dioxide and silica when these competed for the same alkali oxide. A mixture of sodium carbonate and silica was heated in a covered platinum crucible until constant in weight, the partial pressure of the carbon dioxide amounting to 0·07 atmosphere. As soon as equilibrium was established, a stream of dry carbon dioxide was introduced into the crucible, which was again heated until the weight was constant. The partial pressure of the carbon dioxide could in this manner be altered; in each experiment, the weight of the molten mass and the temperature were determined. Similar experiments were also made with mixtures of silica with potassium and rubidium carbonates respectively. When the molten mass crystallised, no evolution of gas was perceptible. When equilibrium had been established with a partial pressure of 0·7 atmosphere at 1300°, about 20 per cent. of the original sodium carbonate was not decomposed, whilst at 870° 34·5 per cent. was not decomposed. With a mixture of 2·890 grams of potassium carbonate and 1·262 grams of silica, 10 per cent. of the carbonate was not decomposed at 1300°, and 19 per cent. at 870°, after the equilibrium had been established under a partial pressure of 0·07 atmosphere. The statement that silica expels carbon dioxide is only true in those cases where the partial pressure of the carbon dioxide sinks; the converse holds where the partial pressure of the carbon dioxide rises. The larger amount of carbon dioxide obtained with increase of partial pressure increases with the atomic weight of the metal, the carbonate of which is considered, and is so considerable that it cannot be attributed to the dissociation of the carbonate.

From a diagram where the ordinates represent partial pressures and the abscissæ the relationship, oxide : oxide + carbonate, in gram-mols., it is deduced that the molecular amounts of the oxides of different alkali metals increase with increase of the dissociation pressure of the molten mass, if the partial pressure of the carbon dioxide is not varied. The amount of alkali oxide which was formed in the molten mass of the carbonates, at the same temperature and under the same pressure of carbon dioxide, diminished in the series Li_2CO_3, Na_2CO_3, K_2CO_3, Rb_2CO_3, and Cs_2CO_3. The amount of oxide formed was estimated (1) by heating under definite partial pressure until the weight of the mass was constant, (2) by adding barium chloride to the aqueous solution of the molten mass and then titrating with phenolphthalein as indicator, and (3) qualitatively by precipitation with silver nitrate. A. McK.

Complex Silver Salts. GUIDO BODLÄNDER and W. EBERLEIN (*Zeit. anorg. Chem.*, 1904, **39**, 197—239).—In order to determine the formulæ of complex silver salts in solution, solubility determinations may be made or measurements taken of the *E.M.F.* of concentration cells of solutions of the complex compound in presence of an excess of the easily soluble component of the complex. The second method was employed by the authors. If the complex ion D has the formula M_mR_n, a very small amount of it is split up into the constituents, and, at constant temperature, $[D]/[M]^m[R]^n = \text{constant}$. The concentration of the free metal ions in two solutions, containing each a different amount of complex ions and constituent R, is expressed by $[M_1]/[M_2] = \sqrt[m]{[D_1][R_2]^n/[R_1]^n[D_2]}$. The relationship $[M_1]:[M_2]$ can be determined by measurement of concentration cells. From two pairs of solutions with different amounts of D and R it is possible to calculate m and n, and in this way to ascertain the formula of the dissolved complex ion. The value for $[D]$ can be determined in such solutions, where the whole of the metal is in solution, as a complex salt. The determination of $[R]$, the non-metallic portion of the complex ion, is more difficult. For the discussion of this and other difficulties, such as the uncertainty of the degree of electrolytic dissociation of the complex salt, reference should be made to the original paper.

During the measurements, it is necessary to take precautions that no atmospheric oxygen is in solution, since the silver electrodes, in the presence of oxygen, are readily soluble in the electrolytes used, more particularly in solutions of potassium cyanide; hence the values obtained cannot be constant if air is present in the solutions. The apparatus used is depicted. Solutions of silver iodide in potassium iodide were first examined where, in one limb of the apparatus, the concentration of the potassium iodide was the same, but that of the silver iodide was different from those in the other limb. The following relationship was accordingly obtained: $[M_1]/[M_2] = \sqrt[m]{[D_1][D_2]}$. The ratio $[M_1]:[M_2]$ of the free silver ions was deduced from Nernst's formula for the value of the concentration cell. The values quoted show that in the more dilute solutions examined the complex ion contains 2 atoms of silver and that, in the solutions richer in potassium iodide, other complex ions are present which contain only one atom of silver. A second class of concentration cells was next examined, where the concentration for the complex salt was equal, but that for potassium iodide varied; in this case, there was evidence for the existence in solution of compounds of the types $K_2Ag_2I_4$, $K_3Ag_2I_5$, $K_4Ag_2I_6$, and $K_5Ag_2I_7$, whilst K_3AgI_4 is possibly present in the more concentrated solutions. The concentration of silver ions in $N/1$ potassium iodide solution is $8{\cdot}9 \times 10^{-17}$, a value in agreement with that deduced from solubility determinations. From measurements of silver potassium thiocyanates, it is deduced that the complex ion contains only one atom of silver and that the formulæ of the complex salts are $K_3Ag(CNS)_4$ and $KAg(CNS)_2$. It is not probable that ions of the type $Ag(CNS)_3$ occur. Salts of the type $K_3Ag(CNS)_4$, when dissolved, decompose into the salts $KAg(CNS)_2$ and KCNS. Silver chloride dissolves in potassium thiocyanate solution with difficulty. Measurements, next made with silver potassium cyanides, showed that the compounds $KAg(CN)_2$ and $K_2Ag(CN)_3$ were present in solution. Silver cyanide of the type AgCN cannot exist in aqueous suspension; the solid, stable silver cyanide has the formula $Ag,Ag(CN)_2$. The formation of nitrile from potassium cyanide and *iso*nitrile from silver cyanide may be accounted for by the author's observations. The relationships which obtain by interaction of an $N/0{\cdot}1$ solution of potassium cyanide with equivalent amounts of silver chloride, bromide, and iodide respectively are also considered. The action of sulphuric acid on silver silver cyanide is thus represented: $H_2SO_4 + Ag,Ag(CN)_2 = Ag_2SO_4 + 2HCN$. Potassium silver cyanide is the best electrolyte for the silver voltameter, provided that no oxygen is present. The *E.M.F.* of silver towards a potassium cyanide solution which is less than $N/0{\cdot}05$ is represented by $E = 0{\cdot}444 - 0{\cdot}056 \log[Ag(CN)_2'] : [CN']^2$; this value is smaller than that obtained for zinc, copper, or gold in potassium cyanide solutions.

Silver chloride and silver bromide have a very slight tendency to form complex ions. A. McK.

Action of Iodine on Silver Nitrite. Wilhelm Neelmeier (*Ber.*, 1904, 37, 1386—1388).—A carbon tetrachloride solution of iodine, when shaken during some 3 days with solid silver nitrite, gives a theoretical yield of nitric peroxide according to the equation $I_2 + 2AgNO_2 = 2AgI + N_2O_4$. The peroxide was estimated by taking an aliquot part of the brown solution, shaking with excess of dilute sodium hydroxide solution, estimating the total nitrogen as ammonia, and the nitrite by permanganate. It was not found possible to obtain dinitryl, $NO_2 \cdot NO_2$, a compound isomeric with the peroxide. J. J. S.

The Existence of Mono-ammoniacal Silver Nitrate. Albert Reychler (*J. Chim. phys.*, 1903, i, 345—357).—Crystallisation of a concentrated solution of molecular quantities of silver nitrate and ammonia yields a product which seems to be $AgNO_3,NH_3$. Kuriloff has shown that the product varies in composition, and regards it as a mixture of silver nitrate with the di-ammonia-compound, $AgNO_3,2NH_3$. The author confirms these results and finds that the composition varies with the quantities of the constituents employed, and that with small excess of ammonia the crystals contain considerably more of this compound than is represented by $AgNO_3,NH_3$. The quantity of silver oxide precipitated by ammonia is in fair agreement with the equation $AgNO_3 + AgNO_3(NH_3)_2 + H_2O \rightleftarrows Ag_2O + 2NH_4 \cdot NO_3$. The mixture of the constituents in the crystals is, however, so intimate that the author views the substance as a solid solution. L. M. J.

A New Method of forming Calcium Carbide. L. M. Bullier (*Compt. rend.*, 1904, 138, 904—905).—The author points out that the method of preparing calcium carbide by electrolysis of the chloride in a graphite crucible described by Moissan (compare this vol., ii, 333) is not new, and only differs in a few unimportant details from the method which he patented in 1895. M. A. W.

Decomposition of Barium Nitrate by Heat. B. N. Gottlieb (*Chem. Zeit.*, 1904, 28, 356).—Barium nitrate was heated in a platinum boat at various temperatures, the gas evolved in each particular experiment being measured and analysed. For the purpose of regenerating nitric acid from barium nitrate, it is best to heat the latter very quickly to a high temperature. A. McK.

Action of Dry Hydrogen Chloride dissolved in Anhydrous Benzene on Dry Zinc. Kaufman G. Falk and Campbell E. Waters (*Amer. Chem. J.*, 1904, 31, 398—410. Compare Patten, Abstr., 1903, ii, 417).—An account is given of a number of experiments carried out with the object of determining the action of dry hydrogen chloride dissolved in anhydrous benzene on zinc. In the earlier experiments, it was found that, although great care was taken to avoid the introduction of moisture, a slight action always occurred, bubbles of hydrogen being evolved and a protective coating of chloride being formed on the zinc. This action usually continued for 2—3 hours.

The later experiments showed that the more completely the dehydration was effected, the less was the action which took place. In those cases in which the greatest precautions were adopted, the white coating was not produced, but the surface of the zinc became darkened and the formation of hydrogen bubbles ceased within an hour. E. G.

Zinc-aluminium Alloys. HECTOR PÉCHEUX (*Compt. rend.*, 1904, 138, 1103—1104).—Zinc and aluminium form nine well-defined alloys corresponding with the formulæ Zn_3Al, Zn_2Al, $ZnAl$, $ZnAl_2$, $ZnAl_3$, $ZnAl_4$, $ZnAl_6$, $ZnAl_{10}$, and $ZnAl_{12}$, with the sp. gr. at 16° of 5·704, 5·488, 4·639, 3·685, 3·638, 3·400, 3·140, 3·084, and 3·040 respectively; the melting points lie between those of zinc and aluminium, and increase from Zn_3Al to $ZnAl_{12}$. All the alloys are brittle, the first two are the hardest, the last three the softest; the first two also present a crystalline surface on fracture, the rest do not; the first three are slightly sonorous, the remaining six possess a good resonance. All the alloys are readily attacked by concentrated or dilute hydrochloric acid, by concentrated sulphuric acid, by hot nitric acid, concentrated or dilute, or by hot concentrated potassium hydroxide solution. Concentrated nitric acid attacks only the first three, and concentrated potassium hydroxide solution attacks only Zn_2Al, $ZnAl$, $ZnAl_2$, $ZnAl_3$, and $ZnAl_4$ in the cold. The alloys are not attacked by hydrogen sulphide in the cold, or by distilled water in the cold or at 100°.

M. A. W.

Lead-aluminium Alloys. HECTOR PÉCHEUX (*Compt. rend.*, 1904, 138, 1042—1044).—The ingot obtained by cooling a fused mixture of lead, sp. gr. 11·23, and aluminium, containing 2 per cent. of iron and traces of carbon and silicon, sp. gr. 2·67, is made up of three layers, the lower and upper consisting of pure lead and aluminium respectively, the middle one being an alloy of the two metals containing 90 to 97 per cent. of aluminium, according to the rate of cooling and the hygrometric state of the mould. The specific gravities of the alloys decrease with the increase in the proportion of aluminium, the alloys containing 93, 95, and 98 per cent. of aluminium, having sp. grs. of 2·745, 2·674, 2·600 respectively, whilst the melting points increase. The colour of the alloys resembles that of aluminium, but is less bright; they are malleable, pliable, less hard than aluminium, can be engraved, and present a close granular structure on breaking. Each alloy is merely a molecular juxtaposition of the two metals, for on melting and drawing into rods of much smaller diameter the composition is altered, the alloy becoming richer in lead; thus, from the three alloys containing respectively 93, 95, and 98 per cent. of aluminium, three new ones were obtained containing 92, 94, and 96 per cent. of aluminium and having sp. grs. of 2·765, 2·691, and 2·671 respectively. In respect of their chemical properties, the alloys are not acted on by moist air; hydrochloric acid dissolves the aluminium at 13°; concentrated sulphuric acid dissolves both metals, liberating hydrogen at 13° and sulphur dioxide on heating; concentrated nitric acid has very little action at the ordinary temperature, but an energetic one on heating; the dilute acid has little or no action; concentrated potassium hydroxide or aqua regia dissolves them readily in the cold; hydrogen sulphide blackens the alloys containing 92 to 93 per cent. of aluminium, and distilled water is without action even at 100°. M. A. W.

Dissociation of Lead Nitrate. LEO BAEKELAND (*J. Amer. Chem. Soc.*, 1904, **26**, 391—399).—When pure lead nitrate, enclosed in a vacuous, sealed glass tube, is heated at 357°, decomposition takes place and the tube becomes filled with red fumes. On allowing the tube to cool slowly, the red vapour gradually disappears and the vacuum is re-established. These changes are due to the reversible reaction, $Pb(NO_3)_2 \rightleftarrows PbO + O + 2NO_2$.

This reaction has been investigated with a view to determine the dissociation pressure at different temperatures and the influence of an excess of either of the gaseous products on it. The special apparatus devised for these experiments is described in detail with the aid of diagrams. It was found that at temperatures between 223° and 448° the pressure of the evolved gases gradually increased to a maximum and then remained constant. This limiting pressure, which represents the pressure of dissociation of lead nitrate, varies with the temperature and is practically constant for each temperature. The value of this dissociation pressure at different temperatures is as follows. At 223°, 6·2 mm.; at 230°, 6·9 mm.; at 250°, 11·8 mm.; at 274°, 32·6 mm.; at 296°, 78·4 mm.; at 357°, 514·0 mm.; and at 448°, 1180·0 mm.

If the gaseous products of the dissociation are removed and the residue is again heated until the maximum pressure is attained, it is found that the dissociation pressure remains constant until the lead nitrate has suffered considerable decomposition. At a certain point, the partially decomposed salt shows a large decrease in its dissociation pressure, which at 357° suddenly falls from 514 mm. to 260 mm. The residue is now of a slightly yellow colour and has the composition of a basic lead nitrate, $3PbO,2N_2O_5$.

If the apparatus is left in communication with the vacuum pump for 10 days, during which period the lead nitrate is maintained at a temperature of 357°, the residue afterwards undergoes no further decomposition at this temperature, shows no dissociation pressure, and has the composition $3PbO,N_2O_5$. This basic salt is decomposed at a red heat with formation of lead oxide.

Experiments were undertaken with the object of determining the influence of the relative proportions of nitrogen peroxide and oxygen in the gaseous products on the dissociation pressure of lead nitrate. The results are tabulated, and show that the introduction of variable amounts of oxygen and nitrogen peroxide before applying heat to the tube containing the salt occasions a considerable decrease in the dissociation pressure. E. G.

Interaction of Sodium Arsenate and Lead Acetate. LEONARD DOBBIN (*Pharm. J.*, 1904, [iv], 18, 582—583).—The quantitative test prescribed by the B.P. for ascertaining the purity of sodium arsenate has been investigated and found to be substantially, but not strictly, accurate. When sodium arsenate and lead acetate react in aqueous solution, the precipitate consists chiefly of normal lead arsenate, although the liquid becomes slightly acid owing to the liberation of acetic acid. If, however, the precipitation is effected in presence of added acetic acid, lead hydrogen arsenate, $PbHAsO_4$, is the main product of the reaction. E. G.

Copper and Oxygen. E. HEYN (*Zeit. anorg. Chem.*, 1904, 39, 1—23).—The freezing point curves of mixtures of copper and cuprous oxide, where the maximum amount of cuprous oxide used in any experiment was 9 per cent., have been determined with the view of deciding whether the liquid solution solidifies to a broken or to an unbroken series of mixed crystals. It was found that the series of mixed crystals was a broken one; the curve deduced from the experimental results is discussed from the standpoint of Roozeboom's criteria. In the transition from the liquid to the solid state, the solubility of copper in cuprous oxide is practically nil. After solidification, copper and cuprous oxide both separate, that is, there are two solid phases. Pure copper solidifies at 1103°. The eutectic point, where 3·4—3·5 per cent. of oxide is present in the alloy, is 1084°. All other alloys melt within a range of a few degrees, the lower limit being 1084°. The observed depressions of melting point are in accordance with the calculated values.

The solid phases which separated during solidification were also examined microcrystallographically. A. McK.

Double Salts of Rubidium and Bivalent Mercury. HERMANN GROSSMANN (*Ber.*, 1904, 37, 1258—1260).—On adding mercuric iodide to a hot concentrated solution of rubidium iodide until saturation is reached and then cooling, the *compound* HgI_2,RbI separates in bright yellow, prismatic needles. The *compound* $HgI_2,2RbI$ is obtained from a solution containing molecular quantities of the components, and forms large, yellow, four-sided plates. A salt corresponding with the cæsium compound, $HgI_2,3CsI$, could not be obtained.

Rubidium mercury trithiocyanate, $Hg(SCN)_2,Rb(SCN)$, prepared by dissolving mercuric thiocyanate in aqueous rubidium thiocyanate, forms long, colourless, prismatic needles. The *salt*,

$$Hg(SCN)_2,2Rb(SCN),\tfrac{1}{2}H_2O,$$

formed on mixing the components in molecular proportions, separates in large, colourless, monoclinic plates.

Rubidium thiocyanate mercuric cyanide, $Hg(CN)_2,Rb(SCN)$, can be recrystallised from hot water, and forms long, colourless needles. The analogous *pyridine* compound, $Hg(CN)_2,(C_5H_6N)SCN$, prepared from its components, closely resembles it. W. A. D.

Metals of the Cerium Group. WILHELM MUTHMANN and L. WEISS (*Annalen*, 1904, 331, 1—46. Compare Abstr., 1902, ii, 262; 1903, ii, 212).—The oxides of the cerium group of metals have been separated by a modification of the Demarcay-Drossbach method. In each operation, 5 kilos. of the oxides are dissolved in excess of warm nitric acid, and magnesium carbonate added to the solution until it is alkaline to congo-red. On dilution and boiling, the iron, aluminium, manganese, silica, and phosphoric acid are precipitated together with some of the alkaline earths. The mother liquor is evaporated, when crystals of the double nitrates, $2M(NO_3)_3,3Mg(NO_3)_2,24H_2O$, separate. These crystals, together with further crops obtained from the mother liquor, are then fractionally crystallised. After 15 crystallisations, the least soluble fraction is colourless, and the most readily soluble, in which samarium can be detected by the spectroscope, orange-red.

After prolonged fractionation of the intermediate fractions, the following five fractions were obtained: (i) lanthanum with small quantities of cerium and praseodymium, (ii) praseodymium, together with small quantities of cerium, lanthanum, and neodymium, (iii) praseodymium and neodymium, (iv) neodymium with small quantities of praseodymium and samarium, (v) samarium and neodymium with gadolinium, yttrium, erbium, and holmium.

The first fraction was freed from cerium by electrolytic oxidation to ceric salts and separation as ceric magnesium nitrate from a solution in concentrated nitric acid. Any cerium remaining in solution was precipitated by permanganate and sodium carbonate. The mother liquor yielded pure lanthanum, in the least soluble salt. From the second fraction, the cerium and then the lanthanum were separated, and finally the praseodymium fractionated from the neodymium; the praseodymium thus obtained contained only a trace of lanthanum. Fraction (iv), which was very large in quantity, was used as a source of neodymium, the praseodymium being separated first. Finally, a neodymium oxide was prepared which contained 99·5 per cent. of the oxide, and was quite free from praseodymium when examined spectroscopically. Fraction (v) was carefully fractionated, and finally small quantities of samarium oxide isolated from it. In the course of the fractionation, examination of the ultraviolet spectrum served to show when the neodymium had been eliminated. The erbium was separated from the samarium by taking advantage of the fact that the double nitrate of the former is more readily soluble; the samarium was separated from the yttrium earths by fractionation of the oxalates. Evidence was obtained that the erbium consists of at least two elements.

The metals were prepared by electrolysis of the anhydrous chlorides in an enlarged and improved apparatus (compare *loc. cit.*). By this means, large quantities of pure cerium were prepared from the chloride without the addition of alkali or barium chlorides. Since the metals lanthanum, neodymium, and praseodymium melt at a higher temperature than cerium, whilst their chlorides melt at a lower temperature, a higher temperature was required in the neighbourhood of the electrodes in order that a regulus of metal might be formed; this was secured by using very slender carbon electrodes or by using an iron rod to which sticks of carbon were fastened. Lanthanum was isolated by using a current of 50 amperes and 10—15 volts, and neodymium a current of 90—100 amperes and 16—22 volts. In the case of praseodymium, it was necessary to avoid the formation of the dioxide, and consequently a maximum current of 70 amperes was used.

The metals were purified by remelting in crucibles made of pure magnesia, and covered by a layer of barium chloride; ordinary crucibles cannot be employed, as lanthanum, neodymium, and praseodymium attack silicates.

Metallic samarium can only be prepared with difficulty by electrolysing the fused chloride, which is a pale yellow, hard powder, mixed with one-third of its weight of barium chloride, using a current of 100 amperes and a small carbon cathode. The metal is deposited on the carbon, from which it is separated by a golden-yellow carbide. Samarium is a pale grey, lustrous metal, which rapidly becomes yellow from oxidation in the air, has the hardness of steel, and is extremely brittle; its sp. gr. is 7·7—7·8.

A comparison of the physical properties of cerium, lanthanum, neodymium, and praseodymium shows that polished surfaces of the metals are very similar, but exhibit minute differences: lanthanum has the whiteness of tin, cerium that of iron; neodymium has a yellow tinge, which is still more strongly marked in the case of praseodymium. With the exception of lanthanum, these metals are permanent in the air. The following shows the increasing order of hardness: Pb, Sn, Ce, La, Zn, Nd, Pr, Sm. The sp. gr. of cerium is 7·0424; lanthanum, 6·1545; neodymium, 6·9563; praseodymium, 6·4754. It is shown that on plotting the atomic volumes against the atomic weights, cerium, and not lanthanum, occupies an exceptional position. The melting points, which were observed by heating the metals under a layer of potassium and sodium chloride in a crucible of magnesia with a weighted rod of magnesium resting on the surface of the metal, are, for cerium, 623°; lanthanum, 810°; neodymium, 840°; and for praseodymium, 940°. The temperature was measured by a platinum platinum-rhodium juncture to an accuracy of about 10°.

The heats of combustion, owing to the readiness with which these elements can be burnt in air, can be measured in a Berthelot-Mahler calorimeter. The heats of combustion referred to 1 gram of the metal are, for cerium (burning to CeO_2), 1603·15 cal.; for lanthanum, 1602·1; for neodymium, 1506; and for praseodymium, 1476·8 cal.; the three metals last mentioned give the sesquioxide. The high values of the heat of combustion suggest that these metals would be useful reducing agents, since a mixture of the cerium and yttrium groups of metals can be easily obtained. The heat of combustion of such a mixture is, for 1 gram, 1655·5 cal. K. J. P. O.

Alloys of Cerium and Lanthanum. WILHELM MUTHMANN and H. BECK (*Annalen*, 1904, **331**, 46—57. Compare preceding abstract).—When cerium is introduced into aluminium molten in a crucible under a mixture of potassium and sodium chloride, a very great development of heat is observed, the metals being heated to redness. At the same time, a small amount of hydrogen is given off, possibly from the cerium. The product is a mixture of aluminium and a *compound*, $CeAl_4$, which remains in needles or prisms when the metal is treated with an alkali hydroxide. The alloy is brittle, crystallises in the rhombic or monoclinic system [$a : b = 0{\cdot}7706 : 1$], and has a sp. gr. 4·193. The heat of combustion for 1 gram is 3441·19 cal., whereas the calculated value is 3940·5, hence the heat of formation is +499·3 cal., a fact which accounts for the high temperature which results on mixing the molten metals.

Lanthanum forms with aluminium an *alloy*, $LaAl_4$, which is isomorphous [$a : b = 0{\cdot}7517 : 1$] with the cerium alloy; its sp. gr. is 3·923, and the heat of combustion 3481·6 cal., and the heat of formation +395·4 cal. These alloys are extremely stable, are not affected by exposure to the air, are not attacked by nitric acid, but are dissolved by hydrochloric acid and potassium hydroxide although far less readily than their components.

The alloys of cerium and magnesium are regarded as solid solutions, and are formed with an absorption of heat, 84·9 cal. being absorbed in the formation of 1 gram of the alloy of the composition Ce 46·94 and Mg 52·76 per cent. The alloy is silver-white and extremely brittle, and has a sp. gr. 2·744; it does not change in the air, but burns with an intensely bright flame. It is readily dissolved by dilute acids, hydrogen being evolved; its heat of combustion is 3952·4 cal. per gram.

Zinc and cerium combine explosively, forming an alloy containing Ce 32·75 and Zn 66·26 per cent. It is bluish-white, of high melting point, and very brittle. It oxidises readily when exposed to the air, and dissolves easily in dilute acids. The heat of combustion is 1305·5 cal., and the heat of formation +94·48 cal. for 1 gram.

All these alloys combine with hydrogen at 200—400°, forming the hydrides of cerium and lanthanum. At 900°, the alloy of cerium and magnesium interacts with nitrogen, the nitrides of the two metals being produced.

A liquid amalgam of cerium, containing 2·74 per cent. of the metal, and a solid amalgam, containing 10·41 per cent., can be prepared by adding cerium to boiling mercury in an atmosphere of carbon dioxide. They react with water with the evolution of hydrogen, and become covered with a very voluminous coat of ceric hydroxide in moist air; spontaneous combustion frequently takes place. K. J. P. O.

Hydrides and Nitrides of Neodymium and Praseodymium.

WILHELM MUTHMANN and H. BECK (*Annalen*, 1904, **331**, 58—59. Compare preceding abstracts).—*Neodymium hydride*, NdH_2 (?), is formed when strips of neodymium are heated in hydrogen at 220°, and is a brittle indigo-blue solid, which, when heated in air, is converted into a mixture of nitride and oxide. *Praseodymium hydride*, PrH_3 (?), is an amorphous, green solid. *Neodymium nitride*, NdN, formed by direct combination at 900°, is black, easily pulverised, and reacts with water with the evolution of ammonia. The *praseodymium nitride*, PrN, is quite similar. K. J. P. O.

[Preparation of Metals, Metalloids, Alloys.] WILHELM MUTHMANN (*Annalen*, 1904, **331**, 60—63. Compare preceding abstracts).—Escales' patent (D.R.-P. 1903, 145820) for the use of alloys of the cerium group of metals with each other or with aluminium or magnesium as reducing agents is criticised. Attention is drawn to the fact that it is not at present possible, as Escales suggests, to partially remove cerium by electrolysis of the mixed oxides, and then to reduce lanthanum and didymium oxides in the same manner. Such a decomposition has not yet been achieved. The *E.M.F.* necessary for the reduction of the chlorides ($CeCl_3$, 2·46 volts; $LaCl_3$, 2·40 volts; $NdCl_3$, 2·25; and $PrCl_3$, 2·26 volts) emphasise this fact.

K. J. P. O.

Indium. ALFRED THIEL (*Zeit. anorg. Chem.*, 1904, **39**, 119—120. Compare this vol., ii, 177).—The value previously quoted by the author for the atomic weight of indium is too small. Later determinations made with indium tribromide give the value 114·81 ± 0·07.

Indium salts suffer considerable hydrolytic dissociation.

According to potential measurements of indium in solutions of the chloride, the solution tension of the metal amounts to 10^2-10^3 atmospheres: indium is accordingly intermediate between iron and lead. Indium can be quantitatively determined electrolytically with a silvered platinum cathode.

A. McK.

Soluble Ferric Potassium Arsenite. LEONARD DOBBIN (*Pharm. J.*, 1904, [iv], **18**, 585).—When freshly precipitated ferric arsenite, prepared by the interaction of potassium arsenite and ferric chloride, is added to a solution of potassium hydroxide until no more will dissolve, and the resulting solution is evaporated gently to dryness on glass or porcelain plates, a lustrous, amorphous, reddish-brown *substance*, $6K_2O,5Fe_2O_3,9As_2O_3,24H_2O$, is obtained, which dissolves readily in water, forming a strongly alkaline solution. Ferric arsenite is also soluble in concentrated ammonia and yields a product which resembles the potassium compound in appearance, but is insoluble in water.

E. G.

Ammonium Salt of Chromatodiperacid. KARL A. HOFMANN and H. HIENDLMAIER (*Ber.*, 1904, **37**, 1663—1667).—An *ammonium* salt, $CrO_2(O{\cdot}O{\cdot}NH_4)_2$, of *chromatodiperacid* is obtained when chromic hydroxide, mixed into a paste with water, is oxidised at 0° with hydrogen peroxide and then mixed with 10 per cent. ammonium hydroxide also at 0°. It forms dark red, octahedral crystals, and on exposure to the air, or on solution in water at the ordinary temperature, evolves oxygen (about 18 per cent.), yielding ammonium chromate. It is highly explosive when heated, hammered, or moistened with a drop of concentrated sulphuric acid, but is only slowly decomposed in cold 10 per cent. ammonium or potassium hydroxide. It may also be prepared by oxidising an aqueous solution of ammonium dichromate with hydrogen peroxide in presence of ammonia.

The addition of dilute sulphuric acid to the ammonium salt produces the blue colour characteristic of perchromic acid, but this is fugitive and quickly changes to green. The addition of dilute acetic acid gives a blue colour due to ammonium perchromate, which is not extracted by ether.

A constitutional formula $CrO_3 \cdot O \cdot ONH_4$, containing a heptavalent chromium atom, is suggested for Wiede's (Abstr., 1898, ii, 28, 295; 1899, i, 244) blue perchromates. J. J. S.

Complex Inorganic Acids. IX. Friedrich Kehrmann and Bernhard Flürscheim (*Zeit. anorg. Chem.*, 1904, **39**, 98—107).—The salt to which Marignac assigns the formula $4K_2O,SiO_2,12WO_3+aq.$ has, according to the authors, the formula $7K_2O,2SiO_2,20WO_3$. It is formed in accordance with the equation $2(2K_2O,SiO_2,12WO_3)+7K_2CO_3=7K_2O,2SiO_2,20WO_3+4K_2WO_4+7CO_2$. The separation of tungstic and silicic acids may be effected by the action of aqueous hydrofluoric acid on the mixed oxides. The separation of the complex acid from alkalis is conducted by precipitation with quinoline hydrochloride. The authors confirm the observations of Marignac with regard to the compounds $2K_2O,SiO_2,12WO_3,+aq.$ and

$$2K_2O,2H_2O,SiO_2,12WO_3,+aq.$$

By the action of potassium carbonate on the former of these compounds, crystals of the compound $7K_2O,2SiO_2,20WO_3+aq.$ are obtained, from which the duodeci-salt may be regenerated by the action of hydrochloric acid.

From the analytical figures obtained, it is supposed that silicic acid, in the moment of its liberation from its salts by strong acids, is volatile. A. McK.

Complex Salts of Quadrivalent Tin. Arthur Rosenheim and Hans Aron (*Zeit. anorg. Chem.*, 1904, **39**, 170—174).—Whilst in aqueous solution chlorostannic acid suffers partial hydrolytic dissociation, the latter is more marked with bromostannic acid, whilst iodostannic acid is practically completely hydrolytically dissociated.

When an alcoholic solution of pyridine hydriodide is added to the dark brown solution obtained by dissolving tin tetraiodide in an alcoholic solution of hydrogen iodide, the *pyridine stanni-iodide*, $C_9H_7N_2,H_2SnI_6$, separates in bluish-black, glistening needles, which, after a time, decompose with separation of iodine. The *quinoline* salt, obtained in an analogous manner, forms black needles, from which iodine also gradually separates.

The optical activity of *d*-tartaric acid is increased by the addition of stannic chloride. Addition of gradually increasing amounts of an aqueous solution of potassium hydroxide and stannic chloride brought about a distinct rise in the specific rotation; in one set of experiments, the $[\alpha]_D$ at 18° increased from 14·27° to 27·44°, whilst in another set it increased from 12·80° to 45·98° ($t=15°$). It is concluded that one atom of quadrivalent tin unites with one molecule of tartaric acid to form a complex ion (compare Henderson, Orr, and Whitehead, Trans., 1899, **75**, 554).

Potassium stannitartrate, $K_2(SnO)C_4H_2O_6,5H_2O$, is prepared by evaporating an aqueous solution of *d*-tartaric acid (1 mol.), stannic chloride (1 mol.), and potassium hydroxide (6 mols.) to small bulk, and then adding alcohol. *Sodium stannitartrate* was prepared in an analogous manner. A. McK.

[Titanous Sodium Sulphate.] Peter Spence & Sons, Ld. (D.R.-P. 149602).—*Titanous sodium sulphate*, $Ti_2Na_2(SO_4)_4,5H_2O$, is obtained by electrolysing a solution containing titanic sulphate, sodium sulphate, and sulphuric acid. The crystalline basic sodium titanic sulphate may be used for the preparation of the solution. The electrolysis is carried out in a lead-lined vessel with diaphragm, a low current-density being employed. On evaporating until the sp. gr. is 1·145, the new salt crystallises. It is a powerful reducing agent, and may also be applied in the preparation of other titanous compounds. It differs from the titanium alums in the quantity of water of crystallisation, and also in its crystalline form. C. H. D.

Electromotive Behaviour of Vanadium. Luigi Marino (*Zeit. anorg. Chem.*, 1904, 39, 152—169).—Since certain vanadium compounds resemble the corresponding compounds of phosphorus and arsenic, and certain others, on the other hand, are analogous to the corresponding chromium compounds, the author has studied the electromotive character of vanadium itself as contrasted with that of chromium, phosphorus, and arsenic respectively.

The specimen of vanadium employed contained 8·66 per cent. of carbon and 1·6 per cent. of other impurities. It was insoluble in hydrogen haloids, but soluble in hot sulphuric acid (2 vols. acid : 1 vol. water), and when the temperature was further raised to 330°, vanadic acid was formed, whilst the odour of sulphur dioxide was perceptible. Nitric acid of sp. gr. 1·18 readily acts on it to form vanadium nitrate of the type VX_4, whilst vanadic acid is formed from the action of nitric acid of sp. gr. $>1·35$. Vanadic acid is also formed when chloric, perchloric, and bromic acids respectively are employed. Vanadium is attacked by a warm solution of ammonium persulphate, whilst the liquid becomes strongly acid owing to the formation of Caro's acid and sulphuric acid. Vanadic acid is also produced by the action of saturated solutions of potassium chlorate, bromate, iodate, and perchlorate respectively, for instance, $5KClO_3 + 6V = 5KCl + 3V_2O_5$. Vanadium remains unchanged in solutions of the alkali chlorides, bromides, iodides, sulphates, acetates, and oxalates and in solutions of various other salts. Solutions of mercuric chloride, cupric chloride, and ferric chloride are reduced by vanadium to mercurous chloride, cuprous chloride, and ferrous chloride respectively. Vanadium reduces solutions of gold chloride, silver nitrate, platinic chloride, and iridium tetrachloride. Vanadium dioxide ferrocyanide is produced when a solution of a chloride, nitrate, or sulphate is added to a solution of potassium ferricyanide containing vanadium.

When an electrolyte, which has no action on vanadium at the ordinary temperature, is electrolysed with a vanadium anode, a complex vanadium anion is produced, the vanadium going into solution as a quadrivalent ion. The loss of weight of the anode is always greater than that corresponding with the amount of silver separated in the voltameter; this is due to the oxidation of carbon to carbon dioxide. In alkaline solutions, vanadium dissolves as Va $^{1}/_{5}$, independently of concentration, temperature, and current density. Potential measurements were made according to the scheme, V | MX | $NaNO_3$ | $AgNO_3$ | Ag, where X = Cl, Br, OH, and M = Na, K, Zn, Mg, &c.; with the exception of the cases of sodium and potassium hydroxides, the *E.M.F.* was independent of the nature of the electrolyte. The *E.M.F.* of the combination V | MX | H_2CrO_4 | Pt was also determined. In no case did the vanadium become passive.

In electromotive character, vanadium is not analogous to chromium, but to arsenic and phosphorus. A. McK.

Catalytic Decomposition of Antimony Hydride. Max Bodenstein (*Ber.*, 1904, **37**, 1361—1368).—The decomposition of antimony hydride, which is accelerated by the action of the antimony produced, is a case of "autocatalysis." The experimental results obtained by Stock and Guttmann (this vol., ii, 246) are shown by means of a number of tables to accord well with theory. The catalytic action of the antimony is found to be proportional to its mass rather than to its surface, but this is consistent with surface action if the antimony is deposited in the form of numerous small particles. Whether what is measured is the velocity of reaction or of diffusion is difficult to decide; a determination of the temperature-coefficient, which is large in the case of the decomposition of arsenic and phosphorus hydrides, would be valuable. C. H. D.

Interaction between Bismuth Oxyhaloids and an Aqueous Solution of Potassium Hydroxide. Walter Herz and G. Muhs (*Zeit. anorg. Chem.*, 1904, **39**, 115—118).—Bismuth oxychloride was shaken with potassium hydroxide in a thermostat at 30°, when the presence of chlorine ions was soon detected in the solution. It was found that the equilibrium, $BiOCl + KOH \rightleftarrows BiO{\cdot}OH + KCl$, was attained. Since, according to the law of mass action, $[KOH] = k[KCl]$, it was only necessary to estimate the concentration of alkali before and after shaking. The results obtained, however, with a large concentration of alkali are to be accounted for only on the assumption of some secondary reaction.

Bismuth oxychloride assumes a greyish-yellow colour on treatment with alkali.

The behaviour with bismuth oxybromide and potassium hydroxide was analogous. A. McK.

Colloidal Gold. Maurice Hanriot (*Compt. rend.*, 1904, **138**, 1044—1046. Compare Abstr., 1903, ii, 368, 543, 597).—Colloidal gold, prepared by Henrich's method (compare Abstr., 1903, ii, 299), is a bluish-violet powder, slightly soluble in pure water, readily so in alkalis, especially ammonia, insoluble in acids or their normal alkali salts. Acids precipitate it from alkali solution in a hydrated form which, when dried at 100°, is no longer soluble in alkalis, but when dried at 40° temporarily loses its solubility in alkalis, but recovers it on long contact with water. The substance dried at 40° contains 2·04 per cent. of water which it loses at 100°, 6·31 per cent. which it loses at a red heat, 91·53 per cent. of gold, and 0·39 per cent. of sulphur trioxide; it has acid properties, forming salts with certain heavy metals, thus, when a solution of a copper salt is added to an ammoniacal solution of colloidal gold, a precipitate soluble in ammonia, but insoluble in water or potassium hydroxide, is obtained; when dried at 40°, the precipitate becomes insoluble in ammonia, and hydrochloric acid removes copper from it, leaving colloidal gold. Silver nitrate gives a brown coloration with a solution of colloidal gold; the further addition of ammonium nitrate gives a red precipitate soluble in pure water, and containing about 2 per cent. of silver. Lead acetate gives a precipitate with colloidal gold, which is insoluble in ammonia, whilst mercuric chloride gives no precipitate. Colloidal gold does not dissolve in mercury, and when strongly heated in a vacuum 1 gram of the substance gives off 5·2 c.c. of carbon dioxide, 5·4 c.c. of carbonic oxide, and 7·6 c.c. of hydrogen. M. A. W.

Liquid Hydrosol of Gold. ALEXANDER GUTBIER and F. RESENSCHECK (*Zeit. anorg. Chem.*, 1904, **39**, 112—114. Compare Abstr., 1902, ii, 610).—When gold chloride solutions are reduced by phenylhydrazine hydrochloride, the liquid hydrosol of gold so prepared was found to assume various colours, red, reddish-violet, violet, bluish-violet, blue, and even green, in various preparations. The dependence of the colour of the hydrosol on the concentrations of the solutions of gold chloride and phenylhydrazine hydrochloride has now been examined. The dialysed solutions are remarkably stable; they can be filtered and boiled, when the hydrogel can be obtained. The colloidal solutions are decolorised when they are shaken with animal charcoal or barium sulphate. From a solution of gold chloride, it is possible to obtain first the red, then the violet, and finally the blue hydrosol of gold; a lecture experiment is described to illustrate this.
A. McK.

Electrolytic Solution of Platinum. New Method of Preparing Platinocyanides. ANDRÉ BROCHET and JOSEPH PETIT (*Compt. rend.*, 1904, **138**, 1095—1097. Compare this vol., ii, 229, 230).—Platinum behaves like iron or cobalt in respect to its solubility in potassium cyanide under the influence of an alternating current; with platinum electrodes of 5 sq. cm. area, in a 4 *N*-potassium cyanide solution, and with a current density of 20 to 80 amperes per square decimetre and a frequency of 42, 10 to 15 per cent. of the theoretical quantity of platinum passes into solution, whilst only 1 per cent. is dissolved in concentrated hydrochloric acid under similar conditions. If, instead of potassium cyanide, the equivalent of barium cyanide is employed, with a current density of 15 to 60 amperes per square decimetre, 7·5 to 11 per cent. of the theoretical quantity of platinum is dissolved, according to the equation $Pt + 2Ba(CN)_2 + 2H_2O = BaPt(CN)_4 + Ba(OH)_2 + H_2$, and this forms a convenient method of preparing barium platinocyanide. The solubility of platinum and iron varies but little with the density of the current, whilst the solubility of cobalt increases with an increase in the current density.
M. A. W.

Preparation of Potassium Platinosochloride. Peter Klason (*Ber.*, 1904, **37**, 1360—1361).—According to a private communication from Heraeus, potassium platinosochloride is technically prepared by passing sulphur dioxide into a solution of chloroplatinic acid, heated on the water-bath until a sample gives no precipitate with ammonium chloride. A hot solution of twice the calculated quantity of potassium chloride is then added, and the potassium platinosochloride which separates is washed with alcohol and dried in the absence of light. Potassium platinichloride is less suitable than the acid as a starting-point.

Vezes has found (Abstr., 1899, i, 572) that potassium oxalate reduces potassium platinichloride quantitatively. This reaction, however, does not occur in pure platinum solutions, but is dependent on the presence of iridium as a catalytic agent. A solution of potassium platinichloride and oxalate is not altered by boiling, but evolution of carbon dioxide commences immediately on the addition of a solution containing iridium. In presence of much iridium, the reaction may even become violent. C. H. D.

Mineralogical Chemistry.

Mineral Analyses. Frank W. Clarke (*Bull. U. S. Geol. Survey*, 1903, **220**, 1—119).—A collection is given of 507 analyses of minerals, most of them previously published, which have been made in the laboratory of the United States Geological Survey during the years 1880—1903. Over 150 distinct species are represented. L. J. S.

Presence of Argon in the Gases of the Fumeroles of Guadeloupe. Henri Moissan (*Compt. rend.*, 1904, **138**, 936—938).—Two specimens of gas were analysed: the first, from the *Fumerolle du Nord*, collected in a depression of the earth full of water at 96°, was saturated with water vapour, contained traces of hydrogen chloride and sulphur vapour, but no hydrocarbons, hydrogen, or carbon monoxide; the percentage composition of the gas was as follows: hydrogen sulphide, 2·7; carbon dioxide, 52·8; oxygen, 7·5; nitrogen, 36·07; argon, 0·73 (compare this vol., ii, 29); the small quantity of water accompanying the gas had an acid reaction, contained hydrogen sulphide, a trace of hydrogen chloride, and traces of iron, chalk, and sulphur in suspension. The second specimen came from the *Fumerolle Napoléon*, was also saturated with water vapour, contained traces of sulphur vapour, but no hydrogen chloride, hydrogen, hydrocarbons, or carbon monoxide, the percentage composition of the gas being hydrogen sulphide, 4·5; carbon dioxide, 69·5; oxygen, 2·7; nitrogen, 22·32; argon, 0·68; the acid liquid remaining in the flask in which the gas had been collected contained no hydrogen chloride, but a considerable quantity of sulphuric acid, and held in suspension sulphur, small quantities of calcium salts, and sesquioxide of iron.

The result of the analyses points to these gases belonging to those volcanic gases in which the carbon compounds are completely burned owing to access of air. M. A. W.

Specific Gravity of Sylvite, Bischofite, and Carnallite. Origin of Bischofite. CARL PRZIBYLLA (*Centr. Min.*, 1904, 234—241).—Determinations of specific gravity, by weighing pure crystallised material in petroleum, gave: sylvite (KCl), 1·9872; bischofite ($MgCl_2,6H_2O$), 1·5907; carnallite ($KCl,MgCl_2,6H_2O$), 1·6018. The sum of the molecular volumes of sylvite and bischofite is 165·39, whilst the molecular volume of carnallite is 173·57; the application of pressure on carnallite would therefore result in the formation of sylvite and bischofite. Although bischofite is the last salt to separate from a saline solution, it is not always met with at the top of the salt deposits, and its occurrence in veins (not beds) of crushed carnallite and other salts is explained as a result of pressure.

From the difference in the amounts of heat absorbed when a mixture of sylvite and bischofite and when carnallite are dissolved in water, the heat of formation of carnallite from sylvite and bischofite is calculated as approximately 23·6 Cal. L. J. S.

Realgar from Allchar, Macedonia. VICTOR GOLDSCHMIDT (*Zeit. Kryst. Min.*, 1904, 39, 113—121).—A crystallographic study. An analysis, by P. Jannasch, of the material examined crystallographically gave results in close agreement with the formula AsS. An analysis of realgar from the Binnenthal, Switzerland, is also given. L. J. S.

Analysis of Lorandite from Allchar, Macedonia. PAUL JANNASCH (*Zeit. Kryst. Min.*, 1904, 39, 122—124).—Analysis of material which had been crystallographically examined by V. Goldschmidt gave the following results, agreeing with the formula $TlAsS_2$ previously assigned to this mineral (Abstr., 1896, ii, 30):

Tl.	As.	S.	Gangue.	Total.
58·75	21·65	19·26	0·08	99·74
59·08	21·32	18·75	0·12	99·27

L. J. S.

Zinc Ores of North Arkansas. JOHN C. BRANNER (*Trans. Amer. Inst. Mining Engin.*, 1902, 31, (1901), 572—603).—Eight analyses of sphalerite from different mines in this region show 64·48—66·27 per cent. of zinc, with only small amounts of impurities, ferric oxide, for example, amounting to 0·15—0·62 per cent. Analyses of smithsonite gave the results under I—III, the last being of a yellow variety known as "turkey-fat."

	ZnO.	CO_2.	H_2O.	SiO_2.	MgO.	CaO.	Fe_2O_3,Al_2O_3.	CdO.	Total.
I.	64·31	34·93	0·58	0·10	0·03	0·90	0·12	trace	100·97
II.	62·20	33·86	2·30	0·02	0·18	1·25	0·21	trace	100·02
III.	63·84	34·60	1·09	0·25	0·07	0·70	0·42	0·90	101·87

L. J. S.

Manganiferous Carbonates from Kuttenberg, Bohemia. A. Bukovský (*Jahrb. Min.*, 1903, ii, Ref. 338; from *Programm. d. Oberrealschule in Kuttenberg*, for 1902, 12 pp.; *Anz. III Congr. böhm. Naturf. u. Aertze, Prag*, 1901, 293).—The following analyses are given of the portions soluble in hydrochloric acid of: I, II, small, rhombohedral crystals of brown-spar; formula, $2CaFe(CO_3)_2,3CaMg(CO_3)_2$. III, cleavage masses of ankerite, $5Ca(Fe,Mn)(CO_3)_2,4CaMg(CO_3)_2$. IV, rose-red manganocalcite, $7CaCO_3,MnCO_3$. V, ferruginous manganodolomite ("*kutnohorite*"), in large, cleavage masses of a white colour with a rosy tinge; Ca : Mn : Fe : Mg = 7 : 5 : 1 : 2. VI, similar to the last, but finer grained; Ca : Mn : Fe : Mg = 3 : 1 : 1 : 1. Analyses are also given of altered manganiferous carbonates.

	$CaCO_3$.	$MgCO_3$.	$FeCO_3$.	$MnCO_3$.	Total.	Sp. gr.
I.	55·69	20·52	21·98	1·13	99·32	2·95
II.	52·16	24·07	21·79	1·35	99·37	—
III.	51·49	17·28	25·80	4·84	99·41	3·05
IV.	85·02	0·45	0·86	13·77	100·10	2·775
V.	44·02	11·04	6·88	38·55	100·49	3·06
VI.	53·24	14·40	13·83	18·53	100·00	3·01

L. J. S.

Formation of Oceanic Salt Deposits. XXXIV. Maximal Tension of Constant Solutions at 83°. Jacobus H. van't Hoff, U. Grassi, and R. B. Denison (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 14, 518—521).—At the highest temperature limit chosen, namely, 83°, kainite no longer separated from solution, but, in addition to rock salt, the following salts must be considered; sylvite, carnallite, bischofite, kieserite, loeweite, vanthoffite, thenardite, glaserite, langbeinite. The paragenesis of these minerals is graphically depicted. The quantitative relationships were experimentally studied by dilatometric methods conducted with the Bremer-Frowein tensimeter.

A. McK.

Formation of Oceanic Salt Deposits. XXXV. Composition of the Constant Solutions at 83°. Jacobus H. van't Hoff, Hans Sachs, and Otto Biach (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 18, 576—586).—The composition of the constant solutions at 83° has now been determined (compare preceding abstract) by the following method. The solution, which was almost saturated, was agitated at 83° with the powdered solid phases until the percentage of chlorine was constant; a further amount of solid was then added until the percentage of chlorine in the solution was unchanged, when the solid phase was analysed. The following solutions were examined: solutions of magnesium chloride, saturated with (*a*) sodium chloride, (*b*) sodium chloride and carnallite, (*c*) kieserite, (*d*) sodium chloride, carnallite, and kieserite respectively. Congruent solutions of the following combinations were next studied, namely, (1) sodium chloride and sodium sulphate, (2) sodium chloride and potassium chloride, (3) sodium chloride, potassium chloride and glaserite, (4) sodium chloride, glaserite and sodium sulphate, (5) sodium chloride, vanthoffite and sodium sulphate, (6) sodium chloride, vanthoffite and loeweite, (7) sodium chloride, kieserite and loeweite, (8) sodium chloride, potassium chloride and carnallite. The remaining combinations were examined, namely, (1) sodium chloride, carnallite, kieserite and potassium chloride, (2) sodium chloride, potassium chloride, kieserite and langbeinite, (3) sodium chloride, kieserite, loeweite and langbeinite, (4) sodium chloride, potassium chloride, glaserite and langbeinite, (5) sodium chloride, glaserite, thenardite and vanthoffite, (6) sodium chloride, loeweite, glaserite and langbeinite, and (7) sodium chloride, loeweite, glaserite and vanthoffite.

The results are tabulated and graphically represented by a space diagram. A. McK.

Monazite in Sands from New South Wales. John C. H. Mingaye (*Records Geol. Survey, New South Wales*, 1903, 7, 222—226).—The sands of the Richmond river contain quartz, zircon, and ilmenite, with small amounts of cassiterite, platinum, iridosmine and gold. The following analysis of a highly concentrated sample from Broken Head, Ballina, shows that monazite is also present.

P_2O_5.	Ce_2O_3.	$(La,Di)_2O_3$.	Y_2O_3.	ThO_2.	SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.
18·91	22·57	22·87	0·16	0·51	6·68	0·16	2·02	1·36

ZrO_2.	SnO_2.	Ta_2O_5.	H_2O.	Au,Pt,Ir,Os,MnO,MgO.	Total.	Sp. gr.
15·40	9·08	0·98	0·11	traces	100·81	5·224

L. J. S.

Wolframite from the Black Hills, South Dakota. J. D. Irving (*Trans. Amer. Inst. Mining Engin.*, 1902, 31, (1901), 683—695).—Compact, black wolframite has recently been mined in the neighbourhood of Lead City. Analysis, by W. F. Hillebrand, of the ore gave:

SiO_2.	WO_3.	Fe_2O_3.	FeO.	Al_2O_3.	MnO.	CaO.	SrO.
12·87	61·50	3·85	9·18	0·52	8·21	0·93	0·02

BaO.	Alkalis.	H_2O.	As_2O_5.	P_2O_5.	V_2O_5.	S.	Total.
0·04	0·08	1·07	1·25	0·12	trace	trace	99·64

L. J. S.

Stolzite and Scheelite from Brazil. Wilhelm Florence (*Centr. Min.*, 1903, 725—728).—Stolzite, as thick-tabular, sulphur-yellow to orange-red crystals (analysis I), and scheelite, as pyramidal crystals and irregular, yellowish-grey grains (analysis II), occur with limonite and native gold in quartzite at Marianna, at the base of Mt. Itacolumi in Minas Geraes.

	WO_3.	PbO.	CaO.	MgO.	Fe_2O_3,Al_2O_3.	Total.	Sp. gr.
I.	50·92	47·78	0·92	0·19	0·03	100·11	8·305
II.	79·75	—	19·84	0·02	—	99·61	5·896

The reactions and microscopic crystals obtained with these minerals in blowpipe beads by the author's method (Abstr., 1899, ii, 51) are described. L. J. S.

Chemical Composition of an American Modification of Gadolinite and Inclusions in it. G. P. Tschernik (*J. Russ. Phys. Chem. Soc.*, 1904, **36**, 287—301).—The author gives the following analyses of specimens of gadolinite, of which I was found in Idaho, II represents inclusions in I, whilst III came from Ytterbia.

	BeO.	FeO.	MgO.	CaO.	SiO_2.	ThO_2.	Y_2O_3.	Ce_2O_3.
I.	9·98	12·74	0·21	0·60	24·41	0·30	42·94	1·94
II.	0·54	1·58	trace	0·62	26·08	2·77	51·94	14·49
III.	1·03	12·99	0·65	0·62	28·87	trace	48·32	2·48

	$(La,Pr,Nd)_2O_3$.	Al_2O_3.	K_2O.	Na_2O.	H_2O.	MnO.	Total.	Sp. gr.
I.	5·52	trace	trace	trace	0·48	—	99·12	4·382
II.	—	—	trace	trace	0·97	trace	98·99	4·536
III.	4·91	trace	trace	trace	0·39	—	100·26	4·223

II may be expressed by the formula: $16[Y_2O_3,2SiO_2] + 2[2Ce_2O_3,3SiO_2] + ThSiO_4 + BeSiO_4 + 2FeO + CaO + 5H_2O$. The author gives a table of the analyses, by other authors, of gadolinites.

T. H. P.

Anthophyllite from Bohemia. V. Rosický (*Jahrb. Min.*, 1903, ii, Ref. 23; from *Abh. böhm. Akad. Wiss.*, 1902, No. **19**, 1—7).—A white, fibrous mineral, proved by its optical characters and the following analysis, by H. Němeček, fills crevices and surrounds nodules in serpentine at Stříbrné Horky near Deutschbrod.

SiO_2.	Al_2O_3.	Cr_2O_3.	FeO.	MnO.	NiO,CoO.
57·19	0·92	0·12	7·98	0·28	traces

CaO.	MgO.	Na_2O.	H_2O (hygros.).	Loss on ignition.	Total.
0·76	28·03	trace	0·48	3·82	99·59

L. J. S.

Regular Intergrowth of Nemaphyllite and Dolomite from the Tyrol. Friedrich Focke (*Tsch. Min. Mitt.*, 1902, **21**, 323—345).—Associated with dolomite and chlorite at the Wildkreuzjoch, Zillerthal, is a chlorite-like mineral, occurring as green scales with a fibrous structure, to which the name *nemaphyllite* is given. H. 3; sp. gr. 2·60. There is a good cleavage parallel to the base, nearly perpendicular to which emerges an acute negative bisectrix, the optic axial plane being parallel to the fibres constituting the plate. Analysis, by R. von Zeyneck, shows the mineral to have the composition of serpentine ($H_4Mg_3Si_2O_9$), from the antigorite, metaxite, and other varieties of which it differs in its structure.

SiO_2.	Al_2O_3.	FeO.	MgO.	CaO.	Na_2O.	Mn,K.	H_2O.	Total.
42·49	0·40	4·63	37·60	0·72	2·11	traces	13·11	101·06

Nemaphyllite also occurs intimately and regularly intergrown with crystals of dolomite in such a manner that the plates and fibres of the former are respectively parallel to the rhombohedral planes and edges of the latter. An analysis of the mixture shows the presence of 36 per cent. of nemaphyllite and 64 of dolomite. L. J. S.

Californian Minerals. WALTER C. BLASDALE (*Bull. Dep. Geol. Univ. California*, 1901, 2, 327—348).—Descriptions are given of various minerals from the crystalline schists and serpentine of the Berkeley Hills, near San Francisco, namely: actinolite (analyses I, II), glaucophane (III, IV), tremolite (V), prochlorite (VI, VII), talc (VIII), diallage (IX), altered diopside (X), serpentinised anthophyllite (XI), and albite (XII).

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	CaO.	MgO.	Na_2O.	K_2O.	H_2O (100°).	H_2O (>100°).	TiO_2.	MnO.	Total.
I.	55·21	3·45	—	7·49	10·50	18·97	2·45	—	—	1·75	—	—	99·82
II.	55·56	2·05	—	5·97	12·13	19·45	1·94	0·30	—	2·58	—	—	99·98
III.	54·52	9·25	4·44	9·81	1·98	10·33	7·56	0·16	—	1·78	0·39	0·46	100·68
IV.	52·39	11·29	3·74	9·13	3·03	11·37	6·14	trace	—	2·57	0·14	trace	99 80
V.	56·68	1·79	1·70	2·23	15·80	19·35	—	—	0·10	2·25	—	—	99·90
VI.	27·38	26·15	0·78	12·70	—	18·92	1·15	—	1·51	11·44	—	—	100·03
VII.	27·03	20·07	4·72	16·47	—	18·90	0·72	1·22	—	11·78	—	—	100·91
VIII.	56·02	9·02	1·10	5·14	0·60	24·10	—	—	0·16	4·34	—	—	100·48
IX.	51·91	3·55	1·30	2·65	22·85	16·15	0·56	—	0·21	0·86	0·10	0·33	100·47
X.	49·62	2·97	2·49	2·99	19·14	19·72	0·60	—	—	2·71	—	—	100·24
XI.	67·09	20·47	—	—	0·24	—	10·96	—	0·27	0·59	—	—	99·62

L. J. S.

Gismondite from Silesia. ARTHUR SACHS (*Centr. Min.*, 1904, 215—216).—Analysis of gismondite from the basalt of Nicolstadt, near Liegnitz, gave the following results, agreeing with the formula $(Ca,Na_2,K_2)Al_2Si_2O_8,4H_2O$, which is the same as that recently proposed for this mineral by Zambonini (Abstr., 1903, ii, 656).

SiO_2.	Al_2O_3.	CaO.	K_2O.	Na_2O.	H_2O.	Total.
34·19	28·34	13·15	2·35	1·82	20·41	100·26

L. J. S.

Wolchonskoite from Russia. PETR IVANOVIČ KROTOV (*Jahrb. Min.*, 1903, ii, Ref. 177; from *Tageb. XI Vers. russ. Naturf.*, 1901, No. 4, 123—133; *Verh. russ. min. Ges.*, 1902, 40, 1—11).—Wolchonskoite, similar in appearance to that of Ochansk, Siberia, occurs in a calcareous sandstone of Permian age at Uchtym, gov. Viatka, Russia. Under the microscope, it is seen to be finely fibrous and birefringent. Analysis, by Karpov, gave:

SiO_2.	Cr_2O_3.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.	H_2O (comb.).	H_2O (hygros.).	Total.
42·30	19·34	4·38	2·21	4·92	1·60	7·36	18·18	100·29

Formula, $2(Ca,Mg)(Cr,Al,Fe)Si_{10}O_{25},6H_2O$. L. J. S.

Occurrence of Vanadium in New South Wales Rocks, Coals, Clays, &c. JOHN C. H. MINGAYE (*Records Geol. Survey, New South Wales*, 1903, 7, 217—221).—Vanadium, varying from traces to the following maximum amounts, was found: basalt, 0·06 per cent.

V_2O_5; coal, 0·12; bog-head mineral ("kerosene shale"), 0·05; white clay, 0·08. Bricks manufactured from this vanadiferous clay, when exposed to the weather, become stained yellowish-green and red; the colouring matter of the stains is soluble in water, and consists mainly of potassium vanadate.

In Scotch oil-bearing shales was found a maximum of 0·12 per cent. V_2O_5.

An analysis is also given of montanite (Abstr., 1903, ii, 489).

L. J. S.

Physiological Chemistry.

Studies in Body Temperature. I. Influence of Inversion of the Daily Routine. Francis G. Benedict (*Amer. J. Physiol.*, 1904, 11, 145—169).—No tendency to an inversion of the daily temperature curve by inverting the routine of life is observed in any of the experiments here recorded. This is opposed to what is usually stated, but in the present experiments on night workers, the observations lasted over a considerable time, and appear to have been made with great care and assiduity. Due allowance is made for the influence of muscular work in raising the body temperature temporarily.

W. D. H.

Relation of Oxygen and Hæmoglobin. Christian Bohr (*Chem. Centr.*, 1904, i, 902—903; from *Centr. Physiol.*, 17, 682—688; 688—691).—The following equation is stated to represent the relationships of oxygen and hæmoglobin:

$$K.C.y^2\left(1+\frac{k}{x^2}\right)=x^2\left(\frac{B}{y}\right)\div yk.$$

y = c.c. of oxygen which unites with 1 gram of hæmoglobin at x tension.

B = c.c. of oxygen which 1 gram of hæmoglobin is capable of uniting with in maximum.

C = concentration of hæmoglobin solution.

K and k are constants.

The results obtained with hæmoglobin solutions correspond well with those calculated from this formula. In the blood at 150 mm. pressure, the results coincide with those obtained with solutions of hæmoglobin. At lower pressures, the amount of oxygen is smaller with hæmoglobin solutions than in the blood. The name hæmochrome is suggested for the blood pigment; this is probably not the same thing as pure hæmoglobin. In different preparations, the yield of globin differs; possibly also the pigment is united to alkali, and to lecithin in the corpuscles.

W. D. H.

Variations in Respiration and Blood Pressure produced by Propeptone in Dogs. Pierre Nolf (*Bull. Acad. roy. Belg.*, 1904, (ii), 147—153).—Injection of propeptone (proteoses) into the dog's circulation causes the appearance of periodicity in respiration and arterial pressure. This is not the effect of the material injected on the bulbar centres, for similar effects can be produced by any kind of agitation (sensory or painful) in non-anæsthetised animals. The injection of propeptone is simply one means of calling forth these responses, although the variations are usually more regular on account of the diminution of tonus, both in the peripheral vessels and in the action of the vagus, which follows the injection.

W. D. H.

A Perfusion Stopcock. Frank S. Locke (*Proc. physiol. Soc.*, 1904, xii—xiii; *J. Physiol.*, 31). **Action of Dextrose on the Isolated Mammalian Heart.** Frank S. Locke (*ibid.*, xiii—xiv). **Action of other Sugars on the Isolated Mammalian Heart.** Frank S. Locke and Otto Rosenheim (*ibid.*, xiv). **Disappearance of Dextrose when Perfused through the Isolated Mammalian Heart.** Frank S. Locke and Otto Rosenheim (*ibid.*, xiv—xv).—A continuation of previous work on the perfusion of the mammalian heart, including the description of improvements in apparatus. The favouring action of dextrose can be obtained with solutions containing as little as 1 part of dextrose in 100,000 of Ringer's solution. The latent period of 1 to 0·1 per cent. solutions is at most 2—3 seconds. Galactose, rhamnose, *l*-arabinose, and glucoheptose are inactive. Perfusion of 0·1 to 0·25 per cent. solutions of dextrose for 7—10 hours through a rabbit's heart (weighing 5—6 grams) causes the disappearance of from 5 to 9 centigrams of dextrose. No glycolytic ferment is found in the fluid; disaccharides and lactic acid were not found.

W. D. H.

Formation of Glycuronic Acid in the Blood. Raphael Lépine and Boulud (*Compt. rend.*, 1904, **138**, 610—614. Compare Abstr., 1902, ii, 619).—The liver contains glycuronic acid; it is the presence of combinations of this acid to which is attributable the lævorotatory power of blood drawn from the hepatic vein. There is also more glycuronic acid in venous blood generally than in arterial blood.

W. D. H.

The Rennin Action of Blood Serum. Ivar Bang (*Beitr. chem. Physiol. Path.*, 1904, **5**, 395—396).—The statement was made by Fuld and Spiro (Abstr., 1901, ii, 67), that the rennin-like action of blood is due to euglobulin, and the antirennin to pseudo-globulin. In the present paper, the opinion is advanced that euglobulin, when precipitated, simply carries down the ferment with it.

W. D. H.

Action of Concentrated Electric Light and Radium Emanations on Rennin (Chymosin) Renninogen and Antirennin. Sigval Schmidt-Nielsen (*Beitr. chem. Physiol. Path.*, 1904, **5**, 355—376, 398—400).—The time taken to curdle milk is the measure adopted for the activity of the ferment. The action of the substances named is markedly hindered by the ultra-violet rays of electric light. The action of radium emanations is minimal. Thus, in the two experiments cited, the coagulation time of milk was lengthened from $7\frac{1}{2}$ to 9, and from 9 to 10 minutes respectively. W. D. H.

The Origin of Precipitins. R. KRAUS and C. LEVADITI (*Compt. rend.*, 1904, 138, 865—866).—Reasons are given for the view that the precipitins originate from the leucocytes, or at any rate that they are principally derived from these cells. W. D. H.

Absorption through the Skin. SCHWENKENBECHER (*Chem. Centr.*, 1904, i, 1020; from *Arch. Anat. Physiol.*, *physiol. Abth.*, 1904, 121—165).—By admixture with oily materials, many substances are absorbed through the skin; a long list of these is given, which includes alcohol, chloroform, various cyanides, acetone, phenol, salicylic acid, antipyrin, potassium iodide. Strychnine, coniine, carbon monoxide, coal-gas, lithium chloride were not absorbed. The absorbed substances were detected either by their physiological effects, or their subsequent appearance in the urine. Salts such as potassium cyanide were not absorbed as such, but dissociation occurred in the outer skin layers owing to high tension of carbon dioxide. In the case of some salts, absorption of only one constituent occurred; for instance, with lithium salicylate, salicylic acid was absorbed, and lithium not.

W. D. H.

Influence of Thiocyanates on Metabolism. The Amount of Thiocyanate in Saliva and Urine. ARTHUR MAYER (*Chem. Centr.*, 1904, i, 824; from *Arch. klin. Med.*, 79, 194—208, 209—214).—On giving thiocyanates by the mouth, the excretion of thiocyanogen is largely augmented; the oxidation of proteid is diminished, and the amount of unoxidised sulphur compounds in the excretions increased. This agrees with the action of other cyanogen compounds; in particular, hydrogen cyanide lessens oxidative processes.

In regard to the amount of thiocyanate in the saliva and urine of healthy persons, the following numbers are given. A healthy man excretes in the urine an average of 0·0476 gram daily; in women the amount is less. In saliva, the amount is 0·003 gram per litre. Tobacco-smoking, muscular exercise, and fever increase the amount in the urine. The amount in the saliva runs parallel, although the substance in the saliva is not the only source of the urinary thiocyanate. W. D. H.

Formation of Sugar from Fat. EMIL ABDERHALDEN and PETER RONA (*Zeit. physiol. Chem.*, 1904, 41, 303—307).—Finely-minced liver was divided into two portions, one of which was mixed with olive oil, or oleic acid, and blood; the other with blood only. After 5 or 6 hours, the amount of sugar in the different portions was estimated, but the differences found were always within the limits of experimental error, sometimes in one, sometimes in the other direction. These observations, therefore, yield no support to Seegen's view of the formation of carbohydrate from fat in the liver. W. D. H.

The Origin of Lactose. Ch. Porcher (*Compt. rend.*, 1904, **138**, 833—836; Ch. Porcher and Commandeur (*ibid.*, 862—865).—In experiments on pregnant goats from which the mammary glands had been removed, it was found that after delivery dextrose appeared in blood in excess and also in the urine. The conclusion is drawn that the mammary tissue is able in normal circumstances to transform the glucose of the blood into lactose and excrete it. The urinary sugar does not come from the hydrolysis of lactose, because galactose is absent from the urine of these animals. Observations on the urine of women confirm this view. W. D. H.

Influence of Food on Milk Secretion and on the Composition of Milk. Gustav Fingerling (*J. Landw.*, 1904, **52**, 147—149).—Referring to the investigations of Lemmermann and Linkh (*Landw. Jahrb.*, **32**, 559), the object of which was to avoid the use of stimulants in the basal ration, it is pointed out that the substances employed (lucerne and mangels) are both stimulants. Addition of hay distillate to a food containing no stimulant improves both the yield and quality of milk. The same result is obtained by adding fenugreek to hay which has been rained upon. N. H. J. M.

Action of Formaldehyde on Milk. Auguste Trillat (*Compt. rend.*, 1904, **138**, 720—722).—The employment of formaldehyde is shown to render more or less of the casein of milk indigestible. A further objection to its use is that nearly the whole of the formaldehyde remains unchanged, and, being absorbed by the system, may act injuriously on digestion. N. H. J. M.

Adaptation of the Pancreas. F. A. Bainbridge (*J. Physiol.*, 1904, **31**, 98—122).—The dog's pancreas normally contains no lactase, although this enzyme is present in extracts of the intestinal mucous membrane. But, as Weinland showed, when dogs are kept on milk diet for two weeks, their pancreatic juice obtained by secretin always contains lactase. This occurs only when lactose is given by the mouth, not when it is injected subcutaneously; it represents a definite adaptation of the pancreas to diet. Subcutaneous injections of extracts of intestinal mucosa of biscuit-fed dogs do not, but of milk-fed dogs do, cause the appearance of lactase in the pancreatic juice. The pancreas of new-born puppies secretes no lactase; this enzyme appears within a few days. The adaptation described is due to a chemical mechanism; lactose acts on the intestinal mucosa so as to produce some substance which is carried in the blood to the pancreas, which is thus stimulated to produce lactase. Secretin is not modified by diet; it excites the secretion of all the enzymes present in the pancreas at the time.

W. D. H.

End-products of Pancreatic Auto-digestion. III. Friedrich Kutscher and Lohmann (*Zeit. physiol. Chem.*, 1904, 41, 332—342. Compare Abstr., 1903, ii, 670, 737).—Recent research has done much to show the incorrectness of many of Kühne's views on the action of digestive ferments, and the similarity between the action of pepsin and trypsin. In the present investigation, particular attention is directed to the lysine fraction. Part of the lysine fraction (from pancreatic digests after the disappearance of the biuret reaction) obtained as picrate is insoluble in alcohol; the part of the picrate soluble in alcohol is spoken of as the choline fraction. The former contains also a small quantity of another base not yet identified, but no tetra- or penta-methylenediamine, as is the case with digestion with pepsin. Arginine and lysine are end-products of tryptic digestion, but only intermediate products of peptic digestion. W. D. H.

Erepsin. M. Nakayama (*Zeit. physiol. Chem.*, 1904, 41, 348—362).—The feebly alkaline extracts of the intestinal mucous membrane of the ox and rabbit are capable of rapidly splitting peptone into simpler products which do not give the biuret reaction. They are also capable of decomposing the intestinal nucleic acid. In other words, the mucous membrane of the small intestine of these vegetable feeders contains an enzyme similar to the erepsin first described by Cohnheim as obtainable from the dog. W. D. H.

Intestinal Absorption of Propeptone in Dogs. Pierre Nolf (*Bull. Acad. roy. Belg.*, 1904, [ii], 153—198).—The intestinal epithelium rapidly absorbs propeptone (proteoses) in a neutral, alkaline, or acid medium. When very large quantities are absorbed in a neutral or alkaline medium, a very small fraction passes into the blood, but nearly the whole is "fixed" by the intestinal mucous membrane. If the medium is acid, none at all enters the blood. Injection into the veins of the product of pancreatic autolysis (which no longer gives the biuret reaction) causes a marked lowering of arterial pressure, and vascular paralysis of peripheral origin. In sufficient amount, it produces loss of coagulability of the blood, but confers little or no immunity towards propeptone. The final products of pancreatic digestion are rapidly absorbed by the intestinal mucous membrane, but, as in the case of propeptone, they are retained there and do not pass into the blood. W. D. H.

Arginase. Albrecht Kossel and Henry D. Dakin (*Zeit. physiol. Chem.*, 1904, 41, 321—331).—Two different groups of iminolytic ferments are found in the animal organism; one, including trypsin and erepsin, splits off the imino- from the carboxyl-group, the other splits off urea; arginase is one of the latter. Erepsin splits protamine (clupeine) quantitatively into proton, arginine, ornithine, urea, and aminovaleric acid. Another ferment, arginase, splits arginine almost quantitatively into urea and ornithine. Arginase is contained in the intestinal mucous membrane; it was also found in minced liver and expressed liver juice, and can be extracted from the liver by water or dilute acetic acid. It is precipitable from solution by alcohol, ether, and ammonium sulphate. The failure of some observers to find arginine in the products of auto-digestion of organs is doubtless due to the previously unsuspected action of arginase, which must be now placed among Richet's urea-forming ferments. W. D. H.

Effect of Raw Meat Diet on Fowls. CHALMERS WATSON (*Proc. physiol. Soc.*, 1904, v—vi; *J. Physiol.*, 31).—Fowls fed only on raw meat and water succumb at periods from 3 to 16 months, the terminal symptoms being paralytic; the thyroid and parathyroid glands are enormously enlarged. One exception to this rule was noted, and the animal gained weight; after death, it was found to be tubercular. W. D. H.

Relations between Food Fat, Body Fat, and Milk Fat. ALBERT EINECKE (*Bied. Centr.*, 1904, 33, 239—245; from *Inaug. Diss. Breslau*, 1903).—The results of experiments with goats indicate that with liberal and comprehensive rations the yield of milk and fat depends only on the individuality of the animal. There seems to be no direct migration of food fat to the milk, although the food fat is undoubtedly utilised in the production of milk fat. The slow and slight changes in the Reichert-Meissl numbers indicate other sources for milk fat production, such as carbohydrates and proteids. N. H. J. M.

Rhythm of Strips of Heart Muscle. E. G. MARTIN (*Amer. J. Physiol.*, 1904, 11, 103—138).—Isolated strips of turtle's heart contain all the conditions essential for rhythmic action, provided they are brought into play. Immersion in 0·7 per cent. sodium chloride solution induces spontaneous beats, but these do not continue long unless calcium is also present. Smaller amounts of sodium chloride are effective if the solution is kept isotonic by an indifferent substance like cane-sugar. Many other details concerning the action of various salts and the means of inducing recovery after standstill, and a theoretical discussion of the results, are given. W. D. H.

Lymphatic Organs. IV. IVAR BANG (*Beitr. chem. Physiol. Path.*, 1904, 5, 317—320).—The cells of the lymph glands and their nucleate dissolve in physiological saline solution. Thymus cells are unaltered by 0·7 per cent. solution of sodium chloride, but dissolve in distilled water. The nucleate they contain is soluble in distilled water and precipitated by 0·7 per cent. sodium chloride. The red corpuscles of the goose are almost insoluble in water, and their nucleate is precipitated by minimal amounts of sodium chloride. It is difficult to extract all the salt from these corpuscles, and the residue probably hinders the dissociation and solution of the nucleate. These observations support the author's previous views on the importance of nucleate in the constitution of cells. W. D. H.

[Arsenic in Lower Animals]. WALTHER HAUSMANN (*Beitr. chem. Physiol. Path.*, 1904, 5, 397—398).—In sea water containing a small quantity of arsenious acid, the action in *Aiptasia diaphana* forms an unpleasant-smelling gas, indicating the formation of arsines from the acid. This action, however, is mainly attributed to a certain yellow symbiotic alga. W. D. H.

Occurrence of Ethereal Sulphates, Taurine, and Glycine in Lower Animals. AGNES KELLY (*Beitr. chem. Physiol. Path.*, 1904, 5, 377—383).—The occurrence of ethereal sulphates in the skeletal structures of invertebrates has been previously noted. In the present research, none was found in *Tubularia*, *Sertularella*, *Alcyonium*, *Cellaria*, the byssus of *Mytilus edulis* and the head cartilage of sepia. Positive results were obtained among echinoderms, especially in the skin of *Stichopus regalis*. Taurine was obtained from the muscles and organs of Bojanus of *Mytilus*, and is regarded as a direct decomposition product of proteid; glycine could not with certainty be determined here; the organ of Bojanus contains a large amount of fermentable sugar. Glycine was found by Chittenden in the muscles of *Pecten irradians*; it is still more abundant in those of *P. opercularis*. W. D. H.

Glycogen of the Fœtal Liver. EDUARD PFLÜGER (*Pflüger's Archiv*, 1904, 102, 305—319).—The new method of estimating glycogen has shown there is no foundation for the statement that in early periods of fœtal life the liver contains no glycogen, although whether it is richer in that substance in the later periods is not yet settled. Details are given of the dissociation and reassociation of the iodide of glycogen, and also of the means of avoiding admixtures which are present in glycogen as precipitated from liver and muscles of adult animals by means of strong potassium hydroxide. Such contaminations interfere with the iodine reaction. W. D. H.

Removal of the Amino-group (Desamidierung) in the Animal Body. S. LANG (*Beitr. chem. Physiol. Path.*, 1904, 5, 321—345).—This question is one of great importance in the study of nitrogenous metabolism. Several previous observers have found ferments capable of splitting off nitrogen from amino-compounds. In the present research, the finely-divided fresh tissue was mixed with an amino-substance, and the ammonia formed was estimated. Antisepsis was maintained with toluene. It is shown how widespread such an action is; it will possibly explain the formation also of such substances as fat and carbohydrate from the non-nitrogenous residue. There are differences in different cases. Thus, glycine is easily decomposed, especially by the intestine and pancreas; the liver, kidney, suprarenal, and testis come next. It is unaffected by the spleen and lymph glands. Tyrosine is almost unaffected by the liver, but is decomposed by the suprarenal. Uric acid is affected by the liver, spleen, kidney, and intestine, but very little by muscle. The other substances investigated were phenylalanine, leucine, cystin, asparagine, glutamine, acetamide, urea, and glucosamine. W. D. H.

Oxidation of Formic Acid by Extracts of Animal Tissues in the presence of Hydrogen Peroxide. F. Battelli (*Compt. rend.*, 1904, 138, 651—652).—In the presence of hydrogen peroxide, extracts of liver and muscle oxidise formic acid, with the formation of carbon dioxide. No similar oxidation was observed with sugar, oxalates, lactates, or acetates. The substance to which the oxidising action is due has the characters of an enzyme. W. D. H.

The Bile Salts of Ox Bile. Stephan Tengström (*Zeit. physiol. Chem.*, 1904, 41, 210—222).—As a preliminary to the study of the choleic acid compounds in bile, the present research relates to the fractional separation of sodium glycocholate and taurocholate. For this purpose, salts of the heavy metals were used, and different fractions analysed; as a rule, the glycocholate is more readily precipitable. The best results appear to have been obtained with a combination of potassium alum and ferric chloride; the final fraction contained 95·8 per cent. of taurocholate. Sodium chloride causes no precipitate in bile, the salting out of the taurocholate being hindered by the alkali salts present, but after the bile has been treated with lead acetate and ferric chloride and the filtrate freed from iron by sodium carbonate and neutralised with hydrochloric acid, saturation with sodium chloride then produces a precipitate containing 99·4 per cent. of taurocholate. W. D. H.

Human Bladder Bile. Tokuye Kimura (*Chem. Centr.*, 1904, i, 1018—1019; from *Arch. klin. Med.*, 79, 274—289).—The bile was removed after death, and examined in relation to its colour, dry residue, density, and viscosity. Search was also made for urobilin and urobilinogen. Many biles contain the former pigment, and those which do not, contain its precursor. Urobilinogen was identified spectroscopically after removal of the ordinary bile pigment by precipitation with barium oxide; dimethylaminobenzaldehyde hydrochloride then gives a red colour with a typical absorption band in the orange. In order to detect urobilinogen in the fæces by this method, it is necessary first to remove indole and scatole with light petroleum. In addition to the known bile pigments, a brown one not identical with any previously known is described. In a case of obstructed bile duct, hæmatin was also present. The observations in various pathological conditions on bile viscosity are important from the point of view of the etiology of jaundice. W. D. H.

Calorimetric Investigations of Fæces. Hans Lohrisch (*Zeit. physiol. Chem.*, 1904, 41, 308—320).—The importance of a calorimetric examination of the fæces in metabolism experiments is admitted by all, and much of the present paper is concerned with the methods used. The results show that the heat-value of the fæces was always greater than that calculated from the composition. The excess has no regularity in its amount. This is attributed to errors in the chemical analysis; for instance, reckoning the lecithin and cholesterol in the ethereal extract as fat, and the difficulties of estimating correctly the numerous organic substances present. W. D. H.

Chemistry of Malignant Growths. I. S. P. BEEBE (*Amer. J. Physiol.*, 1904, **11**, 139—144).—In the present paper, the examination of four tumours (one cancer, two sarcomata, and one hypernephroma) was undertaken. The principal point of interest recorded is the presence of proteolytic autolysis (leucine, tyrosine, tryptophan, glycine, &c.). The tissue was sterile in each case. Fatty degeneration is believed to involve a kind of proteolysis. In one sarcoma, a substance like glycogen, but possibly with a larger molecule, was found.

W. D. H.

Action of Artificial Oxydases on Infectious Diseases. ALBERT ROBIN and G. BARDET (*Compt. rend.*, 1904, **138**, 783—785).—The action of colloidal metals, especially manganese, in several infectious maladies is to promote oxidation in the tissues, and cure of the disease. W. D. H.

Action of Artificial Oxydases on the Tetanus Toxin. AUGUSTE LUMIÈRE, LOUIS LUMIÈRE, and J. CHEVROTTIER (*Compt. rend.*, 1904, **138**, 652—654).—Manganese salts in the presence of a colloid play the part of an oxydase (Trillat). The same is true for emulsions of iron oxide and cerium oxide. The action of these oxidising agents is to destroy the toxicity of tetanus toxin. W. D. H.

Behaviour of Carbon Monoxide in the Organism. PIERO GIACOSA (*Atti R. Accad. Sci. Torino,* 1904, **39**, 421—428).—About 66—70 per cent. of the total blood in the body of a dog was removed from the carotid artery and replaced, by transfusion through the jugular vein, by a somewhat larger quantity of blood which had been saturated with carbon monoxide. Beyond showing febrile tremors, an increased pulse-frequency, and copious diuresis, the condition of the animal was not greatly affected; after several hours, it was quite normal, and no ill-effects could be detected. Whilst its blood remained saturated with carbon monoxide, the dog could inhale with little inconvenience much larger quantities of the gas, mixed with air, than would be normally sufficient to cause death. From these results, the author considers that the usually accepted theory that carbon monoxide poisons by replacing the oxyhæmoglobin of the blood by carboxyhæmoglobin can no longer be admitted. W. A. D.

The Part played by Benzene in Poisoning by Coal Gas. R. STAEHELIN (*Proc. Roy. Soc.*, 1904, **73**, 78—83).—Coal gas produces first excitation, then rigor of isolated frog's muscles. The excitatory phenomena in frogs are at rest in an atmosphere of carbon monoxide or nitrogen. The specific effects are produced by benzene in the gas, and can be brought about by air containing the same percentage of benzene; there is, however, no reason to suppose that the toxic effect of coal gas on mammals is determined by anything except its content of carbon monoxide. W. D. H

Effect of Sodium Hydroxide Solutions injected Intravascularly, and the Cause of Apnœa. ANTOINE HOUGARDY (*Bull. Acad. roy. Belg.*, 1904, (ii), 123—146).—Intravascular injection of sodium hydroxide increases the alkalinity of the blood, but in the dog this is frequently not apparent owing to the hæmoglobinuria produced. If, as is believed, the alkali fixes the carbon dioxide of the blood, it should lessen the tension of this gas in the blood, and thus, according to Fredericq's theory, produce apnœa. It was found that this is what does occur provided the injection is made rapidly. Section of the pneumogastric nerves does not modify the results.

W. D. H.

Action of Formic Acid on the Muscular System. E. Clément (*Compt. rend.*, 1904, 138, 785—787).—Forty drops of formic acid, neutralised by sodium hydrogen carbonate and taken in half a glass of water daily, increase the muscular force enormously as measured by the ergograph, and delay the onset of fatigue. W. D. H.

Action of Formic Acid on the Organism. L. Garrigue (*Compt. rend.*, 1904, 138, 837).—In reference to Clément's work (preceding abstract), it is pointed out that from experiments on animals the invigorating action of formates had been previously demonstrated by the author (*Maladies microbiennes*, Paris, 1903). W. D. H.

Histological Changes produced by the Injection of Adrenaline Chloride. W. B. Drummond (*J. Physiol.*, 1904, 31, 82—91). **The Influence of Adrenaline Poisoning on the Liver.** W. B. Drummond and D. Noël Paton (*ibid.*, 92—97).—The histological changes produced by adrenaline are partly necrotic, as in the liver and kidney, and partly congestive, as in the lungs. They are due in part to the rise of blood pressure, and in part to a direct toxic action on the tissue cells. Degenerative changes are also seen in the blood vessels. The liver changes probably account for the fall of urea-nitrogen excreted. Brodie's contention that adrenaline is harmful in hæmoptysis is supported. In acute adrenaline poisoning, the degenerative changes in the liver are most marked in the centres of the lobules, and the amount of glycogen is lessened. In chronic poisoning, the amount of glycogen is not necessarily altered. W. D. H.

Action of the Ileo-colic Sphincter. T. R. Elliot (*J. Physiol.*, 1904, 31, 157—168).—Anæmia and adrenaline produce the same effect as sympathetic stimulation, namely, constriction of this sphincter.

W. D. H.

Physiological Action of the Jaborandi Alkaloids. Charles R. Marshall (*J. Physiol.*, 1904, 31, 123—156).—Jaborandi leaves contain pilocarpine, *iso*pilocarpine, and pilocarpidine. Merck's jaborine consists mainly of the two first, but contains in addition an alkaloid possessing an atropine-like action. The action of pilocarpine on the heart is almost exactly similar to that obtained by vagal stimulation. Small doses increase the sensitiveness of the vagus to electrical stimuli. Atropine counteracts an excessive amount of pilocarpine; 1 part of atropine in 1000 of pilocarpine can often be detected physiologically. *iso*Pilocarpine produces a much weaker, and pilocarpidine an even weaker, but similar, effect. The homopilopic portion of the molecule acts as the haptophore group. Solutions containing the hydroxy-acid corresponding with lactone-pilocarpine are inactive. The influence of the glyoxaline part of the molecule has not yet been determined. W. D. H.

Physiological Action of Lobeline. Charles W. Edmunds (*Amer. J. Physiol.*, 1904, **11**, 79—102).—In frogs, lobeline causes first excitation, then depression of the central nervous system, with loss of reflexes and a curare-like action on the muscles. On cold-blooded hearts it acts like nicotine, and also inhibits the action of muscarine. In cats and dogs it is a powerful emetic, due to action on the vomiting centre. In larger doses there are muscular twitchings, convulsions, and finally death. In small doses it stimulates, in large doses paralyses, the respiratory centre. Stimulation of the vagus has no effect on the bronchial muscles after lobeline (Dreser). The effects on blood pressure are all explicable on the hypothesis that the drug first stimulates, then depresses, sympathetic ganglia, especially the superior cervical, vagus, and renal ganglia. Tolerance to the drug was not observed in cats. W. D. H.

Influence of Morphine on the Movements of the Alimentary Canal in Rabbits during Inanition. N. W. Kryloff (*Pflüger's Archiv*, 1904, **102**, 287—304).—In continuation of previous work by Swirski (*Arch. exp. Path. Pharm.*, 1902, **48**, 282), it is shown that in normal rabbits the contents of the stomach and cæcum are about equal in quantity. In inanition of about 4 days, the stomach more or less empties itself, especially if the animal is muzzled, and excess of material is found in the cæcum. If morphine is given, either by the mouth or subcutaneously, the nervous control of peristalsis is weakened, and the contents of the stomach are greater whether the animal is muzzled or not, and the relationship between them and the contents of the cæcum approaches the normal. W. D. H.

Lecithin and Snake Poison. Preston Kyes (*Zeit. physiol. Chem.*, 1904, **41**, 273—277).—Lecithin is the activator for the amboceptor of snake venom; the greater toxicity and hæmolytic action of cobra venom on fœtal ox blood as compared to that of the fully grown ox, is due to the more loosely bound condition of the lecithin in the red corpuscles in the former case. The same explanation is adopted for the greater hæmolytic action exhibited towards the blood of certain classes of animals. The addition of lecithin to the more resistant kinds of blood renders them susceptible to the toxic action of the venom. The venom of several kinds of snakes was investigated. The protective action of Calmette's serum is related in a corresponding way to the avidity of the toxins for lecithin.

W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Action of Oxidising Agents on the Purity of Industrial Fermentations. HENRI ALLIOT and GILBERT GIMEL (*Compt. rend.*, 1904, **138**, 911—913).—The authors find that such oxidising agents as sodium or calcium hypochlorite, ferric chloride, potassium perchlorate or chlorate, or dichromate, manganese dioxide, or hydrogen peroxide have an inhibiting effect on the development of the butyric ferment, hydrogen peroxide, calcium hypochlorite, and manganese dioxide being the most effective in this respect; for this reason, and also because they accelerate the growth of the yeast cells, the presence of oxidising agents during the process of alcoholic fermentation is to be recommended. M. A. W.

Fruit-ether Formation in Alcoholic Fermentation. THOMAS BOKORNY (*Chem. Zeit.*, 1904, **28**, 301—302).—Fruit-ether formation during the fermentation of sugars into alcohol and carbon dioxide, that is, the formation of aliphatic esters with an aromatic odour or of aldehydes with an agreeable odour, is not occasioned by a special enzyme. Fruit-ether formation is invariably dependent on the presence of a fermentable sugar. A. McK.

Action of Trimethylxanthine on Bacterium Typhi and B. Coli. EMIL ROTH (*Arch. Hygiene*, 1904, **49**, 199—228).—The development of *Bacterium coli* may be completely checked by addition of certain amounts of caffeine, whilst *B. typhi* is very slightly, if at all, affected. N. H. J. M.

Amide-splitting Ferments in Fungi. K. SHIBATA (*Beitr. chem. Physiol. Path.*, 1904, **5**, 384—394).—The mycelium of *Aspergillus niger* contains an enzyme or a group of enzymes which are capable of splitting off ammonia from urea, biuret, and certain amino-acids. The term *amidase* is suggested. No tyrosinase was discovered.

W. D. H.

Germination of Barley. ARVID NILSON (*J. Amer. Chem. Soc.*, 1904, **26**, 289—294).—The author considers that the chemical changes which constitute the germination of barley are induced by lactic acid bacteria, and has obtained indications that the acid produces the enzyme from the insoluble protein molecule. Substances injurious to the enzymes do not hinder the growth of barley if the injurious influence can be neutralised by the action of the bacteria. If, however, the bacteria are destroyed without injuring the enzymes, germination is checked for a time.

In addition to lactic acid bacteria, barley contains ammonia-producing bacteria. The presence of the latter accounts for the fact that barley steeped in dilute ammonia will decay, but not grow.

N. H. J. M.

Development of Annual Fatty Plants. Study of the Nitrogen and Ternary Substances. GUSTAVE ANDRÉ (*Compt. rend.*, 1904, **138**, 639—644. Compare this vol., ii, 200).—The relation of phosphoric acid to nitrogen is highest at the end of the flowering period. The variations in the relation of amide to total nitrogen are slight during the whole period of the growth of *Mesembrianthemum crystallinum*, but were more in the case of the two other plants (*loc. cit.*). Nitrates were found at all times, diminishing in quantity during the period of growth, and increasing when no longer required for the production of proteids.

The amount of water-soluble carbohydrates were found to be high during the whole period as compared with the saccharifiable carbohydrates. It is suggested that a transformation of acids into carbohydrates goes on in the daytime, the reverse taking place in the night.

The amount of vasculin differs in the three plants, being small in *M. crystallinum*, considerable in *M. tricolor*, and still greater in *Sedum*.

N. H. J. M.

Fermentative Fat-hydrolysis. EMIL HOYER (*Ber.*, 1904, **37**, 1436—1447. Compare Abstr., 1903, i, 218).—The experiments were made with castor oil seeds as the source of the ferment. All attempts to obtain a solution of the ferment by extraction with various solvents or by Buchner's method were unsuccessful. The residue in the Buchner press possesses the full hydrolysing power of the unpressed seeds. In slightly germinated seeds, the half of the seed containing the shoot contains the smaller amount of ferment. As germination proceeds, the total amount of ferment in the seed diminishes.

A concentrated ferment may be obtained by repeated rubbing of the seeds with cotton oil and pressing through a cloth, the ferment being precipitated as a powder from the oil emulsion on addition of ether or carbon disulphide, or by washing the ground seeds by decantation with ether. These mechanical methods result in a concentration of the ferment, but are always accompanied by a loss owing to incomplete separation.

The hydrolytic effect of a given amount of ferment depends not on the water added, but on the amount of acid present. This amount differs for each acid. The limits within which the amount of any acid may vary are dependent on the nature of the acid; strongly dissociated acids must be present in exact proportion to the amount of ferment, slightly dissociated acids may vary considerably in amount. Carbon dioxide has no effect on the action of the ferment. G. Y.

Plant Constituents belonging to the Group of Non-nitrogenous Extract Substances. ERNST SCHULZE (*J. Landw.*, 1904, **52**, 1—30).—Sucrose was found in seedlings, in the above-ground parts of young cereals and fodder plants, in leaves of trees, flowers, and in most seeds, yellow lupin seeds being the only ones in which it was not found. It was also obtained from the following plants before the flowering period: red clover, lucerne, vetches, rye, oats, Italian rye grass; a small amount was found in potato leaves.

Young rye and oat plants yielded secalose (Abstr., 1895, i, 165) in addition to sucrose. A similar carbohydrate ($[\alpha]_D$ − 24·3°), possibly identical with secalose, was obtained from Italian rye grass. Other carbohydrates soluble in water occur, which yield mucic acid when oxidised.

As regards the substances (hemicelluloses) insoluble in water which are either not, or only very slowly, dissolved by diastatic enzymes, the author's results, obtained with a considerable number of plants, agree with those of Tollens in showing the frequency with which pentosans occur. In the majority of cases, galactose was obtained after hydrolysis.

In the case of seeds free from starch (lupins), the hemicelluloses serve as reserve cellulose, whilst in seeds containing starch (peas and vetches, &c.) they support the starch in its action during germination.

The cell-wall carbohydrates are, for ruminants, almost as important as starch, and more important than soluble carbohydrates such as sugar.

Some of the methods employed in separating and determining the different substances or groups are described. N. H. J. M.

Production of Asparagine. Dmitri N. Prianischnikoff (*Chem. Centr.*, 1904, i, 1017; from *Ber. deut. bot. ges.*, 22, 35—43).—In accordance with E. Schulze's results, it was found that the concentration of asparagine in seedlings may exceed that in the cotyledons, or, in young seedlings, may be the same. It is not known whether the concentration of asparagine, like that of other amides, is higher in the cotyledons than in the axial organs.

Assuming that asparagine is produced chiefly or exclusively from the decomposition products of proteids, the two NH_2 groups must be derived from two molecules of one (or two different) primary amino-acids, or else from diamino- or polyamino-compounds. The complete oxidation of the one amino-acid molecule would not be necessary as the primary decomposition products readily yield ammonia. In this manner, ammonium aspartate could be produced, and from this asparagine. The observations of Butkewitsch (*Tagsbl. XI. Naturforsch. Kongr.*, 1892, 387) (who found that, under the influence of anæsthetics, seedlings accumulate ammonia, whilst the formation of asparagine is retarded) lend support to this view. N. H. J. M.

Solution of the Nitrogenous Substances of Malt. L. Pierre (*Chem. Centr.*, 1904, i, 1112; from *Mon. scient.*, [iv], 18, 190—193).—Potassium dihydrogen phosphate increased the solubility of the nitrogenous matter, especially at 60°; the dipotassium salt had a similar effect, but in a less degree. With increased acidity, there was an increase of non-coagulable nitrogen at 15—68°, the effect being diminished in presence of calcium hydrogen carbonate. Precipitation of phosphoric acid at 15—68° was greatest, and the non-coagulable nitrogen was least, in presence of calcium hydrogen carbonate. Calcium sulphate increased the amount of non-coagulable nitrogen below 50°, and lowered the amount above 50°. Sodium chloride yielded the highest amount of non-coagulable nitrogen. N. H. J. M.

Composition of the Inner Fruit Shell of Coffee. Béla von Bittó (*J. Landw.*, 1904, 52, 93—95).—The fresh substance had the following percentage composition:

Water.	Ether extract.	Nitrogenous substance.	Non-nitrogenous extract.	Crude fibre.	Ash.
11·18	1·15	5·50	20·66	58·87	2·63

The dry matter contains 0·58 per cent. of lecithin (calculated from the organic phosphorus), but no cholesterol, and 21·50 per cent. of pentosans.

The composition of the ash is as follows:

K_2O.	Na_2O.	MgO.	CaO.	Fe_2O_3 and Al_2O_3.	P_2O_5.	SO_3.	SiO_2.	Cl.	CO_2.
32·30	4·35	4·64	11·90	7·10	2·75	2·54	15·95	0·69	17·25

N. H. J. M.

Chemistry of Hips. Karl Wittmann (*Zeit. landw. Versuchswes. Oesterr.*, 1904, 7, 68—74).—Analysis of four samples of the fresh fruit of *Rosa canina* gave the following results: water, 22·88—37·97; crude fibre, 19·86—25·24; nitrogen, 0·541—0·712; extract, 28·95—36·72; acids (as malic acid), 3·06—3·64; tannin, 2·00—2·69; total sugar (as invert sugar), 11·65—15·58; invert sugar, 10·20—13·76; sucrose, 0·59—2·43; crude fat, 1·72—2·59; and ash, 2·43—4·00 per cent.

The average percentage composition of the ash was as follows:

K_2O.	Na_2O.	CaO.	MgO.	Fe_2O_3.	P_2O_5.	SO_3.	Cl.	SiO_2.	CO_2.
23·53	2·40	26·78	7·73	0·52	9·37	3·65	0·30	0·67	25·38

The percentage of total ash is very high, and the calcium is higher than in any other fruit in the same zone. The amount of potassium is very low compared with other fruits. N. H. J. M.

Migration and Return of the Nitrogen and the Chief Ash Constituents in the Leaf and Stem of Polygonum Sachalinense. Josef Seissl (*Chem. Centr.*, 1904, i, 820; from *Zeit. landw. Versuchswes. Oesterr.*, 7, 39—58).—The plants were taken at intervals of 14 days from an area of 1·5 square metre, from June 15 to October 15. Potassium and phosphoric acid begin to return about the middle of June (when their amount is at its maximum), and continue until the end of the vegetative period. Calcium, magnesium, and sulphuric acid do not return, but go on accumulating. The loss of base due to the partial return of potassium is fully compensated by calcium.

The loss of potassium in the leaves and stems amounted to about one-half and two-thirds respectively, whilst the amount of calcium was doubled in the leaves and more than tripled in the stems.

N. H. J. M.

Rhubarb Cultivated in Berne (Rheum Palmatum, β-Tanguticum, and Rheum Officinale Baillon). P. A. A. F. Eijken (*Chem. Centr.*, 1904, i, 1077; from *Pharm. Weekblad.*, 41, 177—181).—Chrysophanic acid, emodin, *iso*emodin, $C_{15}H_{10}O_5$, rhein, $C_{15}H_8O_6$, and anthraglucosides have been found in the rhizomes of *Rheum palmatum*, cultivated in Berne. The anthraglucosides, when hydrolysed by the action of dilute acids, yield chrysophanic acid, emodin, and rhein. The rhizomes of *Rheum officinale Baillon*, also grown in Berne, contained the same compounds with the exception of emodin, and the presence of chrysophanic acid, *iso*emodin, and rhein was detected in the roots. *Diacetylrhein*, $C_{15}H_6Ac_2O_6$, crystallises from glacial acetic acid in pale yellow needles and melts at 247—248°. E. W. W.

Seeds of Rhus Glabra. George B. Frankforter and A. W. Martin (*Amer. J. Pharm.*, 1904, **76**, 151—158).—The mature seed of *Rhus glabra* has been examined with the following results.

The whole seed yields 6·862 per cent. of moisture and 2·65 per cent. of ash; it consists of husk, 39·9 per cent., and kernel, 60·1 per cent. The ground seed, including the husk, was extracted successively with ether, alcohol, and water, and gave 22·36, 6·74, and 4·76 per cent. of extract respectively with these solvents.

The decorticated seed yields 4·93 per cent. of moisture and 1·98 per cent. of ash. On extraction with ether, it furnishes 9·1 per cent. of a pale yellow, mobile oil, which has a peculiar odour, a pleasant taste, becomes viscous at −18°, and solidifies at −24°. This oil has a sp. gr. 0·9203 at 20° and 0·9312 at 0°, and n_D 1·48821 at 0° and 1·48228 at 15°, is optically inactive, and is soluble in most organic solvents. Its absorption spectrum is peculiar, the violet rays being entirely absorbed and a black band appearing in the red portion. Rhus oil is a non-drying oil which gives a saponification value 194·7—195·3, and iodine value 85·96—87·86; on hydrolysis, it yields 8·35—9·28 per cent. of glycerol. It contains 0·696 per cent. of unsaponifiable matter, which consists of a cholesterol melting at 63·5—64°.

The husk of the seed contains 7·32 per cent. of tannic acid, 1·35 per cent. of calcium hydrogen malate, and 8·5 per cent. of a black, semi-solid, non-drying oil which has a sp. gr. 0·9412 at 20° and 0·933 at 35°. This oil gives an iodine value 87·2, and saponification value 179·7. When treated with acetone, about 80 per cent. of the oil dissolves and, on evaporating the solution, is obtained as a pale yellow liquid; the insoluble residue is a black, semi-solid substance.

E. G.

Assimilation of Iron by Spinach. O. von Czadek (*Chem. Centr.*, 1904, i, 832; from *Zeit. landw. Versuchswes. Oesterr.*, 7, 65—67).—By manuring the soil with 0·5 and 2 per cent. of ferric hydroxide, the percentage of iron in spinach plants grown in pots was increased from 0·03—0·18 and 0·23 per cent. on the dry matter. No effect on growth was observed at first, but later on the iron plants were somewhat retarded. N. H. J. M.

Influence of Betaine and of Amines on the Growth of the Sugar-Beet. Karl Andrlík and Vl. Staněk (*Zeit. Zuckerind. Böhm.*, 1904, **28**, 291—297).—As it has been recommended to employ the residue from the desaccharification of molasses for the preparation of a nitrogenous and potash manure, the author has made experiments to ascertain the influence exerted on sugar-beets by the application to the soil of betaine (which is the principal nitrogenous substance of these residues) and of the sulphates of dimethylamine and trimethylamine, these amines being formed in the decomposition of betaine. The results are briefly as follows: (1) in a soil rich in nitrogen, betaine acts favourably on the growth of the beet, but the purity of the juice is diminished (70·7 against 81·9), as also is the amount of sugar (10·2 against 13·25 per cent.); the amount of nitrogen in the roots is only slightly augmented. It is probable that the betaine does not pass as such into the roots, and, as it could not be detected in the soil at the end of the experiments, it presumably undergoes bacterial decomposition. (2) Small quantities of the amines used caused large increases in the root-growth, but the purity of the juice (70·9) and the amount of sugar (9 per cent.) were very low. The nitrogen present in the beets is also considerably augmented. In larger amounts, these amines produce a diminution in the root-growth. (3) Parallel experiments with ammonium sulphate led to much more favourable results than the preceding. T. H. P.

Digestibility of Beet Sections Dried by Different Methods. Oscar Kellner, Jakob Volhard, and Fr. Honcamp (*Bied. Centr.*, 1904, 33, 250—253; from *Deut. landw. Presse*, 1903, 30, 519).—The results of experiments in which sheep were fed with beet sections dried respectively in furnace gases and by a new process with steam showed that there was no considerable difference in the value of the two products. N. H. J. M.

Nutritive Value of Whale Meal. Arno Kaoli and Sigmund Hals (*Bied. Centr.*, 1904, 33, 253—255; from *Norsk. Landmansbl.*, 1903, 22, 395—397).—A sample of fresh, lean whale flesh had the following percentage composition:

Water.	Crude fat.	Crude protein.	Indigestible protein.	Digestible protein.	Ash.
81·58	0·86	17·34	0·30	17·04	0·39

The crude protein contained 14·5 per cent. of amides. The most striking results are the low ash, and the high digestibility of the proteids.

Analyses are also given of 27 samples of whale meal. These show a low digestibility, owing, no doubt, to the methods employed in their preparation. N. H. J. M.

Fibre and Carbohydrates in Feeding-stuffs. Tentative Determination of the Components of Each. P. Schweitzer (*J. Amer. Chem. Soc.*, 1904, 26, 252—262).—The determinations were made by the official method and the chlorate and bromide methods in maize stems and leaves, timothy hay, red clover, and blue grass.

The true value for fibre is the crude fibre less the furfural-yielding constituents calculated as pentosan. To indicate its origin, the latter is given in the tables under the heading fibro-pentosan.

The substances left in the fibre by the bromine method and removed by treatment with acid and alkali are counted as pectoses. These also yield furfural. The results include, therefore, separate determinations of fibro- and pectose-pentosan in addition to the group of "pentosans" derived partly from sugar and starch, but chiefly from carbohydrates of unknown composition. N. H. J. M.

Influence of Artificial Manures on the Behaviour of Water in Soil. Emanuel Gross (*Bied. Centr.*, 1904, 33, 217—218; from *Zeit. land. Versuchswes. Oesterr.*, 1903, 80).—The rise of water in a tube containing fine soil alone was compared with that in similar tubes containing the same soil with 2 per cent. of potassium sulphate, superphosphate, sodium nitrate, and calcium hydroxide respectively. It was found that lime retarded the upward rise of water.

Potassium salts and, in most cases, superphosphate, increased, whilst sodium nitrate and lime diminished the capillarity of the soil. In the case of lime, the diminution amounted to 30—40 per cent.

N. H. J. M.

Can Plant Analysis disclose the Amount of Assimilable Constituents in Soil? M. Stahl-Schröder (*J. Landw.*, 1904, 52, 31—92).—According to Heinrich (*Grundlagen zur Beurteilung der Ackerkrume, Wismar*, 1882), analysis of entire plants gives erroneous indications, and it is most convenient to confine attention to the roots (compare Dikow, *J. Landw.*, 1891).

The results of experiments with oats, made in 1893 and 1894, showed that with increased amounts of manure the corresponding constituents in the roots are also increased. The method can, however, give misleading results as regards the requirements of soils, although useful indications are obtained in extreme cases. It was found that other parts of the plants are affected by manuring as much as the roots, and can be employed with greater advantage, as the analysis of roots growing in soil is open to serious sources of error which are difficult to avoid.

As regards Atterberg's method, the author considers that his results do not show it to be impracticable, but that the influence of climate would have to be studied for several years, since some differences in composition were evidently due to the season. N. H. J. M.

Action of Sterilised and Fermenting Organic Matter on the Solubility of the Phosphoric Acid of Tricalcium Phosphate. Axel Stålström (*Centr. Bakt. Par.*, 1904, 11, 724—732).—The dissolving action of organic matter on tricalcium phosphate depends on the activity of micro-organisms. The nature of the fermentation is influenced by the character of the organic matter. In presence of peat, peat litter, manure, and broth, carbon dioxide-ammonia fermentation was observed; with milk, sour milk, and lactose, lactic fermentation, and with peat and lactose together butyric, fermentation.

Carbon dioxide-ammonia fermentation had very little action on tricalcium phosphate. With lactic and butyric fermentation, the effect was very distinct. N. H. J. M.

Influence of Straw as Manure at Different Depths. Conrad von Seelhorst and W. Freckmann (*J. Landw.*, 1904, **52**, 163—171).—Experiments with oats were made both with loamy and sandy soil in large pots, both with and without aëration, and with different amounts of water.

It was found that when the straw was mixed with the lower half of the soil there was a greater loss of nitrate and a greater injury to the plants than when mixed with the upper half when sodium nitrate had been applied, but in the case of the loamy soil (without nitrate) the presence of straw in the upper half was more injurious than when the straw was mixed with the lower half of the soil.

In the case of sandy soil, straw was more injurious in the subsoil than in the surface soil.

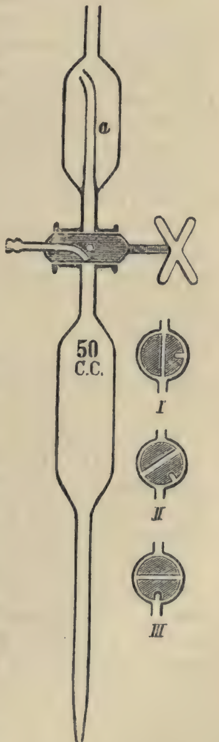
The injurious action of straw is attributed only to its being favourable to denitrification. N. H. J. M.

Influence of Straw Manure on the Yield in Presence of Lime or Sulphuric Acid. Conrad von Seelhorst and W. Freckmann (*J. Landw.*, 1904, **52**, 172—174).—Both lime and sulphuric acid promote the decomposition of straw, and consequently diminish (without, however, entirely overcoming) the injurious effect of straw on crops. N. H. J. M.

Analytical Chemistry.

Safety Pipette. Wilhelm Hirschel (*Chem. Zeit.*, 1904, **28**, 359).—A convenient automatic pipette, which will be readily understood from the accompanying figure.

The pipette is so fixed that the cross-handle of the stop-cock may be readily turned with the thumb. When in position I, the pump acts until the liquid appears in the overflow tube, *a*. The stop-cock is then at once turned through 45° into position II, which stops the further entrance of liquid. By further turning through 45° (III), the liquid runs out. By replacing the stop-cock in position I, the small quantity of liquid in *a* is forced into the overflow space. L. de K.



Substitute for Burette Pinch Clamps. Carl Kippenberger (*Zeit. anal. Chem.*, 1904, **43**, 232—233).—In place of the short piece of glass rod slipped into the caoutchouc tube connecting the jet to the burette, which was suggested by Bunsen, the author prefers a short piece of glass tube, open at its upper end, and having several holes pierced through its sides near the lower closed end. M. J. S.

Burette Stands. CARL KIPPENBERGER (*Zeit. anal. Chem.*, 1904, 43, 233—236).—The burettes are held in clamps so constructed that a number of them can be attached together in a row. Several forms of stand are figured, capable of carrying 9—12 burettes. M. J. S.

A Polarisation Colorimeter. AAGE A. MEISLING (*Zeit. anal. Chem.*, 1904, 43, 137—146).—This apparatus was designed for a hæmoglobinometer, but may be employed for general colorimetric estimations. The principle employed is that of producing by circular polarisation a coloured field which exactly matches the colour of the solution in a column the length of which can be measured. The instrument, which externally resembles a microscope, contains a pair of Nicol's prisms, with a quartz plate between them. The polarising prism and a reservoir for the coloured solution are placed close together on opposite sides of the axis of the tube. Into the solution dips a tube which is closed at the bottom by a thin glass plate and can be raised or lowered by a rack. The distance between this glass plate and the bottom of the reservoir gives the length of column of liquid, and can be read on a millimeter scale. A standard solution of the substance to be estimated is placed in the reservoir. The observer, looking through the upper Nicol, sees then two illuminated discs, and by rotating the analyser while varying the length of the coloured solution can obtain exactly the same colour in both discs. The analyser is then clamped. The standard solution is replaced by that which is to be estimated, and by varying the length of the column the same colour is reproduced. The percentage of the coloured substance is inversely proportional to the length of column required. A single cubic centimetre of solution, containing 5—20 cub. mm. of blood (diluted with a 0·1 per cent. solution of sodium carbonate), suffices for the observations, and it is shown that the length of column varies exactly with the dilution within wide limits. M. J. S.

New Indicator in Alkalimetry. LUCIEN ROBIN (*Ann. Chim. anal.*, 1904, 9, 130).—This indicator, which may be substituted for phenolphthalein, and has, moreover, the advantage of being applicable in the presence of ammonia, is prepared as follows: 10 grams of yellow mimosa flowers are mixed with 200 c.c. of water and heated to boiling; when cold, 50 c.c. of alcohol are added, and, after waiting for an hour, the liquid is filtered into a bottle made of brown glass. One drop of the indicator suffices for 10 c.c. of liquid to be titrated. On adding a drop of $N/10$ alkali, the liquid will turn golden-yellow and again become colourless on adding a drop of $N/10$ acid. Towards carbonates, it behaves exactly like phenolphthalein. L. DE K.

Detection of Chlorides in the Presence of Bromides. H. CHAPMAN JONES (*Chem. News*, 1904, 89, 229).—If silver chloride is treated with a cold saturated ammonium hydrogen carbonate solution for a few minutes and then filtered, the filtrate gives a distinct turbidity when acidified with nitric acid. Silver bromide, when similarly treated, yields no turbidity. To ascertain whether a turbidity is due to silver chloride or bromide, the turbid solution is divided into two parts; to one is added a slight excess of the ammonium hydrogen carbonate solution, and to the other an equal quantity of water. If the turbidity is caused by silver chloride, it dissolves in a few seconds, but if due to the bromide it remains unaffected for nearly an hour. The part diluted with water serves as a comparison. W. P. S.

Detection of Free Chlorine and Bromine. Domenico Ganassini (*Chem. Centr.*, 1904, i, 1172—1173; from *Boll. Chim. Farm.*, 43, 153—157).—A strip of filter paper immersed in a solution of 2 c.c. of aniline oil and 8 c.c. of hydrochloric acid in 40 c.c. of water turns wine-red when exposed to free chlorine and then becomes blue by exposure to the air. In the presence of bromides, the bromine should be first expelled by heating with potassium permanganate and acetic acid; the chlorine is then liberated by addition of a little sulphuric acid. In the presence of nitrous oxide, the paper turns yellowish-brown, changing in the air to greenish-blue. Paper is soaked in a saturated solution of potassium bromide, dried, and then immersed in an alcoholic ammoniacal solution of fluorescein. When dried and exposed to chlorine, it turns rose-red; bromine should be first expelled as directed.

As a delicate test for bromine vapour, the author recommends a paper which has been immersed in a 0·4 per cent. alcoholic solution of fluorescein containing a few drops of ammonia and then dried. A red colour shows the presence of bromine. Should chlorine be also present, the colour does not appear at first, but becomes visible when the paper is exposed to ammonia vapour. It is not discharged by exposure to acetic acid fumes. L. de K.

New Reagents for Titration Purposes; Notes on Iodometry. Fritz Raschig (*Zeit. angew. Chem.*, 1904, 17, 577—585).—A lengthy investigation unsuitable for useful abstraction.

A hydrochloric acid of absolutely known composition, and therefore fit for delicate standardising purposes, may be obtained by passing hydrogen chloride into a weighed amount of water and reweighing.

In a similar manner, a dilute solution of sulphur dioxide of known composition may be obtained and used for standardising iodine solution. The solution of sulphur dioxide should be added to the iodine solution, not the reverse. The reaction between dilute solutions takes place with such accuracy that the mixed hydriodic and sulphuric acids formed may be titrated with $N/10$ soda, using methyl-orange as indicator. L. de K.

Estimation of Fluorine. E. Deladrier (*Chem. Centr.*, 1904, ii, 1104—1105; from *Chem. Weekblad.*, 1904, i, 324—327).—Soluble fluorides are neutralised with ammonia and precipitated with lithium chloride, the precipitate being finally converted into sulphate. Or the solution may be boiled with thorium chloride and the precipitate heated with ammonium nitrate, which converts it into thorium dioxide. Insoluble fluorides are mixed with 15 parts of powdered quartz and heated with sulphuric acid in a current of dry air at 160°. The gaseous compounds are first passed through a bulb containing precipitated silicic acid and then into a flask containing a layer of mercury and a sufficiency of water. After the heating has been continued for 3 hours, the separated silica is filtered off and the solution of hydrofluosilicic acid is precipitated with thorium chloride. After 24 hours, the thorium fluosilicate is collected on a weighed filter, dried, and weighed. L. de K.

Titration of Hydrofluoric Acid containing Hydrofluosilicic Acid. Julius Katz (*Chem. Zeit.*, 1904, 28, 356—357, 387—389).—Ten grams of the previously diluted acid (1 : 10) are weighed in a platinum dish and titrated at the boiling heat with 2*N*-potassium hydroxide, using phenolphthalein as indicator; the result is expressed in terms of hydrogen fluoride. The operation may also be carried out in the cold in a paraffin-coated beaker, but then some calcium chloride should be added.

Ten grams of the same acid are now weighed out in a paraffin-coated beaker, diluted with 100 c.c. of 60 per cent. alcohol, and again titrated. The difference in c.c. between the two titrations represents the hydrofluosilicic acid. The factor to be used in the calculation varies, however, with the relation of the "difference" with the total number of c.c. used. If less than 5 per cent., 0·0576, if from 5—10 per cent., 0·0580—0·0595, if from 10—20 per cent., 0·060—0·061, and if over 20, 0·0617 is employed. The hydrofluosilicic acid thus found, multiplied by 0·833 gives the equivalent amount of hydrofluosilicic acid to be deducted from the result of the first titration. A full theoretical explanation is given. L. de K.

Estimation of Sulphur in Calcium Carbide. Hj. Lidholm (*Zeit. angew. Chem.*, 1904, 17, 558—560).—About 3 grams of the powdered sample are mixed with 15 grams of perfectly dry potassium sodium carbonate and 6 grams of perfectly dry ammonium chloride, and fused in a covered porcelain crucible, using a spirit burner as the source of heat. The fused mass is then introduced into a special apparatus, the air of which is displaced by a current of carbon dioxide, and then decomposed by means of hydrochloric acid. The gases evolved are passed through a series of absorbers filled with a solution prepared by dissolving 5 grams of cadmium acetate and 20 grams of zinc acetate in 200 c.c. of glacial acetic acid and diluting to 1 litre. The last traces of hydrogen sulphide are expelled by boiling while transmitting carbon dioxide.

The precipitate obtained is treated with 10 c.c. of a copper sulphate solution (120 grams copper sulphate, 120 c.c. sulphuric acid, water to 1 litre), which soon acts on the sulphides of cadmium and zinc, forming copper sulphide. This is then collected, washed, ignited, and weighed as oxide. L. de K.

The Sensitiveness of the Sodium Nitroprusside Reaction. C. REICHARD (*Zeit. anal. Chem.*, 1904, **43**, 222—230).—A drop of a saturated solution of sodium nitroprusside gives an intense violet colour with 0·004 c.c. of an ammonium sulphide solution containing 0·0000018 gram of hydrogen sulphide. The sensitiveness of the reaction depends more on the concentration of the sulphide solution than on the absolute amount of sulphide. The same quantity of sulphur, whether in the form sodium sulphide or sodium or ammonium hydrosulphide gives the same intensity of reaction. Presence of excess of sodium hydroxide prevents the development of the violet colour; excess of ammonia has no such preventive action. The yellow solution obtained by saturating sodium hydroxide with sulphur does not give the violet colour with nitroprusside. The violet colour is in all cases ephemeral; its fading seems to be due to the oxidation of the sulphide to sulphite.

M. J. S.

Organically Combined Sulphurous Acid in Foods. K. FARNSTEINER (*Zeit. Nahr. Genussm.*, 1904, **7**, 449—470).—The free and combined sulphurous acid (Abstr., 1903, ii, 326) in solutions of sugars and other substances may be determined as follows: 20 c.c. of the solution, to which a little starch solution has been added, are titrated with iodine solution, to obtain the amount of free sulphurous acid. Five c.c. of 18 per cent. sodium hydroxide solution are then added, and, after 1 minute, 5 c.c. of hydrochloric acid of sp. gr. 1·124. The solution is then again titrated with iodine solution, when the quantity of combined sulphurous acid is obtained. Instead of hydrochloric acid, citric acid may be used. In the case of fruit juices, the most accurate results are obtained by distilling off the combined sulphurous acid after titrating the free portion. Numerous experiments are also described, in which the amount of sulphurous acid entering into combination with various sugars was ascertained. W. P. S.

Estimation of Nitrogen. LÉON DÉBOURDEAUX (*Compt. rend.*, 1904, **138**, 905—907).—The method consists in distilling the nitrogenous compound with a mixture of potassium sulphide and hyposulphite, whereby the nitrogen is converted into ammonia, and then weighed as ammonium chloride; it can be applied to the following types of compounds: (1) oxygenated compounds of nitrogen, (2) hydroxylamine, (3) nitrogen compounds containing a phenol grouping, (4) nitriles, cyanides, and double cyanides, (5) cyanates and thiocyanates, (6) unsubstituted amides and imides, (7) amines which contain an acidic grouping. Experiments in which the alkali sulphide was used by itself or with the addition of salts other than the hyposulphite were unsuccessful.

M. A. W.

Estimation of Nitrogen by Kjeldahl's Method. (*Trans. Guinness Res. Lab.*, 1903, **1**, 13—16).—A distillation apparatus for use with Gunning's modification of Kjeldahl's method of estimating nitrogen in organic compounds is described, which is found to give good results. The vertical tube, through which the ammonia passes to the standard acid solution, is provided with a long, narrow condenser, and is furnished at its lower extremity with a bulb and wide tube leading into the receiving flask; the wide tube either dips into the acid or drops the distillate on to its surface. The condenser is rendered necessary owing to the solvent action of the steam charged with ammonia on the glass, from which alkali is dissolved. Six of these distillation flasks, each of 1 litre capacity, may be arranged side by side, and their condensers connected up in series, the total space occupied being only about 90 × 25 cms.

When the estimation is made on natural products like barley, of which a large quantity must be taken for analysis, it is necessary to use a sufficient amount (20 or even 30 c.c.) of concentrated sulphuric acid to fully oxidise all carbonaceous matter and to leave an excess in which the potassium sulphate forms a tolerably liquid solution on cooling. Otherwise, if the flame under the flask is allowed to play on the unwetted surface of the glass beyond the limits of the acid mixture, as much as 90 per cent. of the nitrogen may be driven off by the superheating of the edges of the highly concentrated solution of sulphate. T. H. P.

A Kjeldahl Apparatus. Max Siegfried (*Zeit. physiol. Chem.*, 1904, **41**, 1—2).—To avoid spirting or "bumping" during the heating with sulphuric acid, the necks of the flasks are clamped to a bar, a slight swinging motion being communicated to the latter by means of a water or electric motor, so that the flasks move to and fro over the burners. W. P. S.

Distilling Apparatus for Kjeldahl's Nitrogen Process. E. Blanck (*Chem. Zeit.*, 1904, **28**, 406).—The apparatus consists of a flask in which the substances are treated according to Kjeldahl's directions. It is fitted with a rubber stopper, bored to receive a tap funnel and also the connection to the distilling arrangement.

The funnel admits the alkali and the potassium sulphide; the distilling arrangement comprises the usual bulb, a condenser, and a pipette-shaped tube, the point of which dips into the standard acid contained in a receiver. Excepting the rubber cork, no other rubber connections are used. At the commencement, the water is allowed to run through the condenser at full speed, but towards the end it is made to run slowly, whilst the contents of the flask are being more vigorously boiled. L. de K.

Modification of Marsh's Apparatus. Casimir Strzyzowski (*Chem. Centr.*, 1904, i, 1228—1230; from *Österr. Chem. Zeit.*, 7, 77—81).—A modified form of the Marsh apparatus, which cannot be well understood without reference to the original paper and illustration.

The operation is conducted as usual after the air has been expelled by a current of carbon dioxide. As a sharp test for distinguishing a faint arsenical mirror from an antimonial one, it is recommended to heat the spot with a drop of dilute Fehling's solution, which is reduced by the arsenic but not by the antimony. L. de K.

Iodometric Estimation of Small Quantities of Arsenious Oxide. Carmelo Russo (*Gazzetta*, 1904, **34**, i, 195—200).—For the detection of small quantities of arsenic, the author makes use of Bloxam's method (Trans., 1860, 13, 12), in which, however, he employs sodium hydrogen sulphate or potassium hydrogen sulphate as electrolyte in place of sulphuric acid; the apparatus used by Bloxam is also modified so as to diminish the resistance. For quantitative estimation, an iodometric method is recommended, the hydrogen arsenide from the electrolytic apparatus being passed into a set of Geissler's bulbs containing a known volume of standard iodine solution, with which the following reactions take place: $AsH_3 + 3I_2 = 3HI + AsI_3$ and $AsI_3 + AsH_3 = 3HI + As_2$; the excess of iodine remaining in the bulbs is titrated with potassium arsenite in alkaline solution. For quantities of arsenious oxide up to about 0·01 gram, this method gives good results. The details are now being worked out. T. H. P.

A New Indicator for Detecting Boric Acid, particularly in Food-stuffs. Lucien Robin (*Compt. rend.*, 1904, 138, 1046—1048. Compare this vol., ii, 440).—Tincture of mimosa gives a yellow colour with boric acid, becoming red on the addition of sodium carbonate. In order to detect traces of boric acid in the presence of other salts by means of this indicator, a strip of filter paper coloured with mimosa tincture is moistened with a concentrated acidified solution of the suspected mixture and then dried; if boric acid is present, the paper will be coloured yellow, and become a brick-red on the addition of sodium carbonate; in the absence of boric acid, the paper will be grey in colour, turning yellow on the addition of the alkali. To detect traces of boric acid in wines, ciders, &c., 10 c.c. of the liquid are neutralised with sodium carbonate, evaporated to dryness, and calcined, the residue is examined for boric acid as in the preceding case; by this means, the presence of 3 mg. of borax in 1 litre of wine can be detected. To detect boric acid in milk, the liquid is coagulated with acetic acid, filtered, and then treated in the same way as the wine.

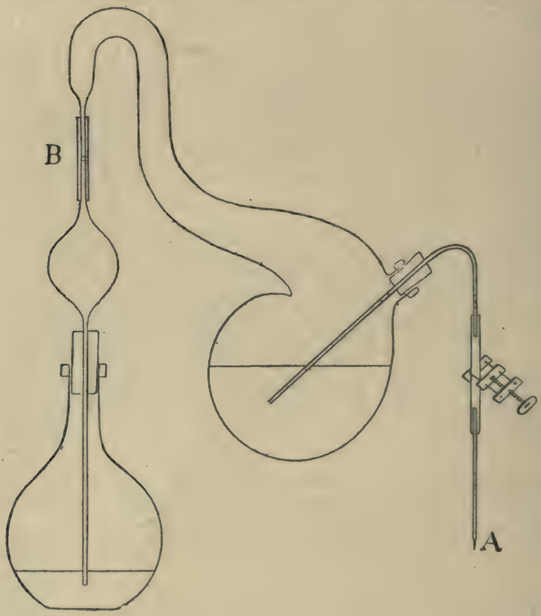
M. A. W.

Estimation of Total Carbon in Coal and Soil. Samuel W. Parr (*J. Amer. Chem. Soc.*, 1904, 26, 294—297).—The substance is oxidised with sodium peroxide in the calorimetric bomb recently described by the author (Abstr., 1900, ii, 710), and, after decomposing the excess of the reagent by boiling with water, the carbon dioxide formed in the combustion is liberated and its volume measured, due allowance being, of course, made for any carbon dioxide contained in the sodium peroxide.

A convenient apparatus for measuring the carbon dioxide is described. L. de K.

Estimation of Carbon Dioxide in Alkalis and Alkali Carbonates. Giacomo Marro (*Atti R. Accad. Sci. Torino*, 1904, 39, 307—312).—The apparatus employed consists of a retort, the neck of which is bent. The retort, which has a capacity of 350—400 c.c., is one-third filled with distilled water to which a drop of phenolphthalein has been added; the water is boiled for two minutes to expel carbon dioxide, and a quantity of the dissolved alkali, containing about 0·2 gram of carbon dioxide, is then introduced by means of a pipette.

Fifty c.c. of standard baryta solution are measured into the flask and heated to boiling, whilst the liquid in the retort is simultaneously boiled for two or three minutes so as to completely expel the air from the retort and pipette; during this operation, the cork is not fixed in the neck of the flask, but at the end of it it is rapidly introduced and the burners taken away. Immediately afterwards, the point A is immersed in a mixture of sulphuric acid (1 : 1) with twice its volume of boiling water, so that the acid is sucked into the retort until the alkaline colour of the phenolphthalein is destroyed; the clamp on the india-rubber tube is then closed, the liquid in the retort gently boiled, a tube containing soda-lime is attached to A, and a slow current of air allowed to pass into the retort by carefully opening the screw-clip. The flame beneath the retort should be as small as possible. It is best to surround the flask containing the baryta with warm water, and to then gradually cool this by adding cold water; in this manner, the liquid in the retort can be boiled for five minutes without a flame. After ten minutes' boiling, the flame is extinguished and a more rapid current of air admitted; the flask is detached, closed at B with a pinchcock, and shaken for 20 minutes to ensure complete absorption of the carbon dioxide. The residual baryta is then acidified with a slight excess of *N*/5 sulphuric acid, using phenolphthalein as indicator, and the excess of acid titrated by *N*/20 sodium carbonate. Very concordant results are obtained by using this method; the error due to the presence or absorption of atmospheric carbon dioxide is completely obviated.



W. A. D.

Analysis of Organic Substances with the Help of Sodium Peroxide. Hans H. Pringsheim (*Amer. Chem. J.*, 1904, 31, 386—395. Compare this vol., ii, 146).—The method already proposed for the rapid estimation of chlorine, bromine, and iodine in organic compounds is described in detail. The reaction takes place more satisfactorily if, instead of sodium peroxide alone, a mixture of this compound with 4 per cent. of a carbohydrate is used.

In the case of liquid substances, a closed crucible is employed. The lid of this crucible can be screwed on, and is provided with a hole just large enough to hold a capillary glass tube into which is fused a copper wire connected to a piece of fine picture wire of such a length as to touch the bottom of the crucible. After the substance has been mixed with the sodium peroxide, the lid is screwed on and the crucible is connected to one pole of an electric battery, whilst the copper wire is attached to the other pole. The fine wire is thus fused and the mass inside the crucible is ignited.

The estimation of phosphorus and arsenic in organic substances can also be effected by means of sodium peroxide, but in these cases it is preferable to employ a silver crucible and to use a hot copper wire for starting the reaction in order to avoid the introduction of iron. In the case of phosphorus, the alkaline solution is acidified with hydrochloric acid and afterwards neutralised with ammonia and precipitated with magnesia mixture. In the case of arsenic, the alkaline solution is twice evaporated with nitric acid in order to oxidise the whole of the arsenious acid to arsenic acid, which is then precipitated according to the method of Friedheim and Michaelis (Abstr., 1896, ii, 74).

An attempt was made to extend the use of sodium peroxide to the estimation of nitrogen, but so far the method has proved unsuccessful.

E. G.

Estimation of the Inorganic Constituents of Human Organs. Max Dennstedt and Theodor Rumpf (*Zeit. physiol. Chem.*, 1904, 41, 42—54).—To estimate the true mineral compounds in various organs such as the liver, &c., and also in blood, the finely divided organ should be treated with a large volume of water for 24 hours. The solution obtained is boiled to precipitate albumin, and, after the latter has been separated, is used for the different estimations. Sulphuric acid and phosphoric acid, present as sulphates and phosphates, are directly estimated as usual, whilst the calcium, magnesium, iron, &c., are estimated in the ignited residue from a known volume of the solution. An analysis of the ash of the organ does not show the real relation of acids to bases, as on ignition the organically combined sulphur and phosphorus form sulphates and phosphates with the bases.

W. P. S.

Estimation of Potassium in the Ash of Plants. Edward Murray East (*J. Amer. Chem. Soc.*, 1904, 26, 297—300).—The vegetable matter to be tested is drenched with a 20 per cent. solution of ammonium nitrate, dried, and incinerated at a moderate heat in a muffle. The ash so obtained is dissolved in the smallest possible quantity of hydrochloric acid, boiled, and mixed with a slight excess of barium hydroxide. The filtrate is precipitated with a calculated amount of sodium sulphate and the filtrate concentrated to a small bulk. After acidifying with hydrochloric acid, the potassium is estimated by means of platinum chloride according to the conventional Lindo-Gladding method. L. DE K.

Gasometric Estimation of Calcium, Barium, Strontium, Manganese, Potassium, and Copper. E. RIEGLER (*Zeit. anal. Chem.*, 1904, 43, 205—214).—The insolubility of the iodates of the above metals in dilute alcohol and their reaction with hydrazine sulphate allows them, when occurring singly, to be estimated by the same method as that adopted for ammonia (this vol., ii, 207). The general formula of the iodates of these metals is $M''(IO_3)_2$ (in the case of potassium, $KH_2(IO_3)_3$), and each IO_3 group yields in all cases 3N. The solution of the metal (10—15 c.c.) is mixed with excess (1 gram) of iodic acid, heated to ebullition, cooled, mixed with alcohol, shaken, and allowed to repose for 1—2 hours. The precipitate is then collected, washed with 95 per cent. alcohol until free from acid, and decomposed in the azotometer. If potassium has been precipitated as platinichloride, this may be dissolved in water and treated with iodic acid in the same way as any other potassium salt.

The copper salt, which, after drying over sulphuric acid at the ordinary temperature, has the composition $Cu(IO_3)_2,H_2O$, may be collected on a weighed filter and weighed. M. J. S.

Reaction of Copper Salts [with Titanous Salts]. EDMUND KNECHT (*Mem. Manchester Phil. Soc.*, 1904, 48, [9], 1—4).—If titanous sulphate be added to a moderately concentrated solution of a cupric salt, immediate precipitation of metallic copper takes place. Owing to the difficulty of filtering the finely-divided copper, and to the fact that it rapidly oxidises and redissolves in the sulphuric acid present, the reaction cannot be used for the estimation of copper. With very dilute solutions of copper, the reaction requires from 2 to 30 minutes for its completion. A solution containing 0·001 per cent. of copper gives a distinct pink coloration when viewed by transmitted light. The reaction should be allowed to take place in the cold, as heating causes precipitation of titanic hydroxide. W. P. S.

Estimation of Small Quantities of Mercury. THEODORE W. RICHARDS and SIDNEY KENT SINGER (*J. Amer. Chem. Soc.*, 1904, 26, 300—302).—The mercury is precipitated from its solution (as nitrate) by introducing a clean copper coil. When the bulk has apparently deposited, a second coil is introduced and left in the liquid for several hours. Free nitric acid should be practically absent. The amalgamated copper coils are washed with water, then with alcohol, dried in a desiccator over calcium chloride, and weighed. After heating at about 350° in a current of hydrogen, the coils are reweighed, and the loss represents the mercury. L. DE K.

Estimation of Manganese by the Persulphate Method. HUGO LÜDERT (*Zeit. angew. Chem.*, 1904, 17, 422—423).—A slight modification of the process introduced by von Knorre (Abstr., 1903, ii, 760).

Four grams of the sample (free from tungsten) are put into a large flask and dissolved in 50 c.c. of boiling nitric acid of sp. gr. 1·2. The solution is diluted with 400 c.c. of water, 40 c.c. of sulphuric acid of sp. gr. 1·18, and 50 c.c. of ammonium persulphate solution (120 grams per litre) are added, and the whole is boiled for half an hour. The solution is rapidly cooled and mixed with 15 c.c. of hydrogen peroxide. This is made of such a strength that 10 c.c. correspond exactly with 9·4 c.c. of standard permanganate (1 c.c. = 0·00577 gram iron); the check should be made immediately before use. After the manganese peroxide has completely dissolved, the excess of hydrogen peroxide is titrated with the permanganate. L. DE K.

Rivot's Estimation of Iron in the presence of Zirconium. ALEXANDER GUTBIER (*Zeit. anorg. Chem.*, 1904, 39, 257—258).—Polemical. A reply to Daniel (this vol., ii, 149). A. McK.

Colorimetric Estimation of Iron in Blood by Meisling's Universal Colorimeter. H. P. T. OERUM (*Zeit. anal. Chem.*, 1904, 43, 147—159).—By converting the iron either into ferric thiocyanate (Jolles' method) or ferrocyanide, and the employment of Meisling's colorimeter (this vol., ii, 440), an estimation of the iron can be made with great accuracy in a quantity of blood not exceeding 0·1 c.c. The blood, measured with a fine pipette, is dried and incinerated in a porcelain crucible, the ash fused with 0·1 gram of potassium hydrogen sulphate, the fused mass dissolved either in 4 c.c. of 1 per cent. hydrochloric acid and treated with 1 c.c. of a 3 per cent. solution of potassium thiocyanate, or else in 3 c.c. of $\frac{1}{4}$ per cent. acid, and treated with 1 c.c. of a 0·5 per cent. solution of potassium ferrocyanide. The former solution must be examined immediately, as its depth of colour falls off in about 10 minutes, but it is easy to make 20 readings before this takes place. The latter mixture does not reach its maximum depth of colour for 2 minutes, but is then sufficiently stable to allow of 100 readings before the blue precipitate begins to separate in flocks. By taking the mean of 10 readings, the errors of individual readings are practically eliminated, and the results of different preparations agree closely. M. J. S.

Separation of Iron and Chromium by means of Fused Potassium Nitrate. FRANK SOUTHERDEN (*Chem. News*, 1904, 89, 183).—The precipitate containing the hydroxides of iron, aluminium, and chromium is dried, placed in a test-tube, a little potassium nitrate is added, and the whole cautiously heated until fused. A small piece of potassium hydrogen sulphate is then added and the heating continued until brown fumes are evolved copiously. The chromium is thus completely oxidised and may be separated from the iron and aluminium in the usual manner. Even chrome-iron ore is decomposed sufficiently to give a decided reaction for chromium. W. P. S.

Separation of Vanadium from Aluminium and Iron. B. Glasmann (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 314—317).—To the solution containing vanadium together with aluminium or iron, sufficient potassium iodide and dilute sulphuric acid (1 : 5) are added and the mixture heated for 20 minutes, when the following reaction occurs: $V_2O_5 + 4HI = V_2O_3 + 2H_2O + 2I_2$; the iodine is dissolved by sulphurous acid. The solution is neutralised by the addition of potassium hydroxide until a precipitate begins to separate, this being then dissolved in a few drops of strongly diluted acid and the solution diluted to 100 c.c with water. A few c.c. of a mixture of 20 per cent. potassium iodide and 7 per cent. potassium iodate solutions are then added, the aluminium or ferric sulphate acting thus: $Al_2(SO_4)_3 + 5KI + KIO_3 + 3H_2O = 2Al(OH)_3 + 3K_2SO_4 + 3I_2$; the precipitation of the ferric or aluminium hydroxide is completed by heating on the water-bath for half an hour. The iodine is dissolved in thiosulphate and the ferric or aluminium hydroxide filtered off, washed well, ignited, and weighed. The filtrate containing vanadium trioxide is evaporated to dryness, with the addition, firstly, of sulphuric acid to remove the iodine, then of nitric acid to form vanadium pentoxide, and finally of sulphuric acid to displace the nitric acid. The residue is dissolved in water, acidified with sulphuric acid, mixed with sulphurous acid to reduce the V_2O_5 to V_2O_4, and when the excess of sulphurous acid is removed by boiling and passing a stream of carbon dioxide through the liquid, the latter is titrated at 70° with potassium permanganate solution: $2KMnO_4 = 5V_2O_5$. The method is found to give good results. T. H. P.

Cupellation of Platinum Alloys containing Silver or Gold and Silver. William J. Sharwood (*J. Soc. Chem. Ind.*, 1904, 23, 412—413).—The experiments described were made to ascertain the extent to which lead is retained in the cupellation of platinum alloys, and also the extent to which the platinum dissolves during parting (this vol., ii, 151). The results show that the lead retained decreases, whilst the platinum dissolved by the nitric acid increases, with an increase in the ratio of silver to platinum. Silver and platinum remaining constant, an increase in gold appears to decrease the solubility of the platinum. The retention of lead seems to depend mainly on the fusibility of the button, oxidation ceasing for practical purposes when the button solidifies. W. P. S.

Nicloux's Process for Estimating very Small Quantities of Alcohol. M. Emmanuel Pozzi-Escot (*Ann. Chim. anal.*, 1904, 9, 126—129. Compare Abstr., 1902, ii, 233).—Nicloux has published a process for estimating very small quantities of alcohol, consisting in heating the distillate with sulphuric acid and standard solution of potassium dichromate until the latter is in slight excess, as shown by the greenish-yellow colour of the liquid. The author has again been unable to obtain concordant results, and is therefore unable to recommend the method. L. de K.

Estimation of Glycerol in Fats. Richard Fanto (*Zeit. angew. Chem.*, 1904, 17, 420—421).—The method is more particularly devised for the analysis of oxidised or partially saponified fats. Ten grams of the sample are saponified with 100 c.c. of *N*/2 alcoholic potassium hydroxide, 100 c.c. of water are added, the fatty acids are liberated by adding acetic acid, and the bulk of the alcohol is boiled off. When cold, the cake is detached and the liquid passed through a filter; the remaining glycerol may be obtained by melting the fatty acids about five times with about 20 c.c. of water. In the case of liquid acids, some paraffin wax may be added. The united aqueous liquids are now boiled down to 60—70 c.c., and when cold made up again to exactly 100 c.c. Five c.c. of this solution are then treated by the author's hydriodic acid process (Abstr., 1903, ii, 515). L. de K.

Action of Molybdates on Polyphenols and their Derivatives. C. Frabot (*Ann. Chim. anal.*, 1904, 9, 123—124).—Ten grams of ammonium molybdate are dissolved in 100 c.c. of hot water, and when cold 10 c.c. of sulphuric acid are added. When a few drops of this reagent are added to a solution of quinol or *p*-phenylenediamine, or, in fact, to any para-derivative, a stable blue coloration is developed on boiling. L. de K.

Dry Defecation in Optical Sugar Analysis. Wm. D. Horne (*J. Amer. Chem. Soc.*, 1904, 26, 186—192).—In determining the polarisation of a raw sugar, an error is introduced, owing to the fact that a precipitate is formed by the basic lead acetate added to the solution of the normal weight of sugar before making up to 100 c.c. In order to obviate this error, the author recommends defecating in such a way that the normal weight of sugar shall remain dissolved in 100 c.c. of the solution. This is done by making the solution of the normal weight up to 100 c.c., and then adding small quantities of powdered, anhydrous, basic lead acetate until the impurities are all precipitated. Some refinery solutions, notably such as have been subjected to the influence of bone-black, have a tendency to coat the grains of lead salt with insoluble adherent crusts, and so prevent the solution of the interior portions; this difficulty may be overcome by adding coarse, dry sand with the lead salt to the solution before shaking. Comparison of the numbers obtained by this method of working with those obtained by the old method, allowance being made for the volume occupied by the lead precipitate, shows that it gives good results.

T. H. P.

Rapid Estimation of Starch in Barley and Malt. (*Trans. Guinness Res. Lab.*, 1903, 1, 79—91).—For estimating starch in barley or malt the following rapid method has been devised; it is based on the cupric reduction only, and thus does away with the tedious extraction of the optically active amylans required by O'Sullivan's method (Trans., 1884, 45, 1), as it has been found that these substances yield no reducing sugar when treated with malt diastase. The grain is first ground very finely in a Maercker mill, and about 5 grams of it are weighed out into a paper thimble, which is then placed in an extraction apparatus. The flask of the latter is preferably round-bottomed and of copper, and to avoid over-heating the condensed vapours, the wide vapour tube of the extractor, which is essentially of the Soxhlet form, is connected with the top of one of the condenser tubes, of which two are rendered necessary by this arrangement; the wide vapour tube is also provided, near the lower end, with a bulb to prevent froth from passing into the condenser, and so into the extractor. Ether extraction is omitted, as the fats, besides not being a disturbing factor, are extracted equally well by the alcohol of sp. gr. 0·920, of which 80 c.c. are introduced into the copper flask, together with 0·5 gram of paraffin of high melting point to prevent frothing. The working of the apparatus is then adjusted so that the barley in the thimble is washed with alcohol of sp. gr. 0·900 for 3 hours (malt requires 9 hours), when the whole of the reducing substances and the nitrogen compounds soluble in alcohol are removed. No starch passes over into the extract. The contents of the thimble are now transferred to a beaker containing about 100 c.c. of water, and the whole thoroughly boiled. After cooling to 57°, 10 c.c. of an active malt-extract are added, and the conversion allowed to proceed for 60 minutes. The solution is then boiled, filtered into a 200 c.c. flask, the residue well washed, and the volume adjusted after cooling. The cupric reduction of 20 c.c. is next determined under the standard conditions laid down by Brown, Morris, and Millar (Trans., 1897, 71, 94), and the maltose calculated from the copper reduced according to Table XI (*loc. cit.*, p. 100), after allowing for the reduction due to the malt-extract. The starch equivalent of this maltose is then ascertained, assuming, if the conditions of the theoretical conversion of starch into maltose and dextrin ($10C_{12}H_{12}O_{10} + 8H_2O = 8C_{12}H_{22}O_{11} + 2C_{12}H_{20}O_{10}$) have been complied with, that 84·4 parts of maltose correspond with 100 of starch. To bring the conversion down to this point, malt dried on the kiln at 50—52° and having a diastatic power of 80 on Lintner's scale must be employed. If a less diastatic malt is used, the amount of maltose formed per 100 of starch must be determined by a preliminary experiment with pure starch; malt having a diastatic power of 40 Lintner yields only 82 parts of maltose per 100 of starch. Malts with higher diastatic powers than 80 carry the conversion beyond the stage represented by the above equation.

A determination of the moisture in the barley or malt is carried out at the same time as the estimation of the starch, which is then calculated on the dry matter of the barley or malt. T. H. P.

Lintner's Soluble Starch and the Estimation of "Diastatic Power." John S. Ford (*J. Soc. Chem. Ind.*, 1904, 23, 414—422).—Attention is drawn to the necessity of observing certain precautions in this estimation, and the author considers that many of the contradictory results obtained by various observers are due to the lack of recognition of the important influence of traces of impurity on the course of the action. The latter attains its maximum in neutral solution. Asparagine does not augment the action unless there has been a previous restriction. This also applies to the various salts which are said to accelerate the action. The restricting influence of acids depends on their dissociation—the greater the amount of free hydrogen ions, the greater the restriction, although it is possible that the anion of certain acids may have some influence. Properly purified soluble starch, or starches, of various origins give equal maltose productions, with equal amounts of diastase, under standard conditions. An example is given of the "diastatic power" of a malt as estimated with different soluble starches bought from dealers. The results obtained varied from 34 to 6 on Lintner's scale. W. P. S.

Estimation of the Mono-amino-Acids and their Amides. (*Trans. Guinness Res. Lab.*, 1903, 1, 17—56).—A critical examination of the methods previously given for the estimation of amides and amino-acids, together with an account of improvements in these methods and of new methods which have been devised.

The first process examined was that which Sachsse (Abstr., 1873, 652) gave for the estimation of asparagine, which is based on its hydrolysis into aspartic acid and ammonia when boiled with 10 per cent. hydrochloric acid. On determining the ammonia formed by Knop's hypobromite method, results considerably in excess of the proper values were obtained. Replacement of the hydrochloric acid by 5 per cent. oxalic acid solution gave much better results, which were, however, not obtainable in all cases. On estimating the ammonia formed by hydrolysing asparagine by hydrochloric acid (10 c.c. concentrated acid diluted to 100 c.c.) by distillation with magnesia at 35° under reduced pressure in a specially designed apparatus, the numbers obtained were constantly 5 per cent. below the theoretical ones, so that the authors propose to employ this method and to increase the values arrived at in the proportion of 95 : 100. Using 5 per cent. oxalic acid solution as the hydrolysing agent, equally concordant results were obtained, but in this case a 10 per cent. correction must be applied; the hydrolysis is, in this case, much slower than when hydrochloric acid is used. It is concluded that the reaction involved in the hydrolysis of asparagine by oxalic or hydrochloric acid cannot be truly represented by the usually accepted equation in which one mol. of asparagine yields one mol. of ammonia, and that the apparently theoretical results obtainable with the hypobromite method under certain conditions are due to some secondary reaction tending to augment the volume of nitrogen obtained.

Next is given a description of an apparatus for determining amino-acids and their amides by a modification of Sachsse and Kormann's method (Abstr., 1875, 784), which is based on the reaction of these substances with nitrous acid, by which means they give up the whole of their nitrogen in the gaseous state. The air in the apparatus is displaced by pure carbon dioxide, and the ferrous sulphate originally employed for absorbing the nitric oxide formed is replaced by oxygen, the excess of which is subsequently absorbed by alkaline pyrogallol solution. Under these conditions, good results are obtained with asparagine, aspartic acid, glutamic acid, leucine, alanine, glycine, and phenylalanine. Tyrosine gives unsatisfactory results with nitrous acid, but after previous bromination normal values are obtained; the brominated solution must, however, only be introduced into the apparatus after expulsion of the air, otherwise low numbers are always arrived at.

Tyrosine may also be estimated as *dibromotyrosine*, $C_9H_9O_3NBr_2$, which may be prepared by treating a dilute hydrochloric acid solution of tyrosine with an excess of potassium bromide and the calculated quantity of sodium bromate; it crystallises from water in well-formed, flat prisms melting at 222°, has a feebly acid reaction to litmus, and does not form a salt with hydrochloric acid, but yields an extremely insoluble *copper* compound, $(C_9H_8O_3NBr_2)_2Cu$, which may be used to separate it from a mixture. The estimation of the tyrosine is carried out as follows: a weighed quantity is dissolved in 20 per cent. hydrogen chloride solution, which is mixed with 10—15 c.c. of a 20 per cent. potassium bromide solution, and then titrated with $N/5$ sodium bromate solution; the end of the reaction is easy to observe, the last drop of bromate solution required giving a persistent, deep yellow colour, but if the original solution is coloured, starch and potassium iodide may be used as an indicator.

The following scheme for estimating ammonia, amidic nitrogen, and amino-acid nitrogen gives good results: (1) the total nitrogen is determined by Kjeldahl's method. (2) The ammonia present is determined by distillation in a vacuum at 35° with magnesia (*vide supra*). (3) A measured portion of the solution is hydrolysed with 10 per cent. hydrochloric acid for 2 hours, thus liberating one-half of the nitrogen of the amide as ammonia. The ammonia is then estimated by distillation with magnesia in a vacuum, a correction of 5 per cent. being added for the constant error. From the ammonia thus found is deducted that originally present as such [see (2)], the remainder being a measure of the nitrogen present as amidic nitrogen. (4) A portion of the original solution is then submitted to the modified Sachsse-Kormann process described above, any tyrosine present being previously brominated. The nitrogen thus obtained, diminished by the amide nitrogen found by (3) and then divided by two, gives that present in the form of amino-acids. (5) Tyrosine, if present, is determined directly by the bromine method, and on deducting its nitrogen equivalent from the total nitrogen of the amino-acids determined in (4), the nitrogen of the amino-acids other than tyrosine is arrived at.

Following the suggestion of Schulze (Abstr., 1883, 315), it is found that mercuric nitrate may be employed as a precipitant for asparagine. Excess of this reagent is added, in the cold, to the asparagine solution, and the precipitate filtered off and washed with water. The acid filtrate is then rendered slightly alkaline by means of sodium hydroxide solution and the precipitate thus obtained added to the first one, the whole being then treated with hydrogen sulphide to liberate the asparagine. On separating the latter as its copper salt,

$$(C_4H_7O_3N_2)_2Cu,$$

by the addition of copper acetate to a solution rendered slightly acid with acetic acid, which is afterwards removed by evaporation, it is found that the whole of the asparagine is recovered. With aspartic acid, this method only allows of the recovery of 89·3 per cent. of the original quantity of acid. T. H. P.

Estimation in Barley and Malt of the Total Amount of Nitrogenous Substances Soluble in Water. (*Trans. Guinness Res. Lab.*, 1903, 1, 61—78).—The conditions have been investigated under which the soluble nitrogenous constituents of barley and malt may be extracted in order to show the changes occurring in these substances during germination. To avoid the difficulties introduced by the diminution in weight of the grain during malting, all the determinations are calculated with reference to the weight of dry matter in 1000 corns of the original barley. In making the extractions, it is found that the time of digestion and the ratio of grain to water influences the results considerably, due, in the former case, to proteolytic changes taking place, and in the latter to changes of solubility of proteids such as the globulins, produced by changes in the concentration of the mineral salts present. The standard conditions chosen to overcome the latter difficulty were such that, whether dealing with barley or malt, the total final volume of extract and residue together always contained the equivalent of 20 grams of the original dry barley per 100 c.c.; the volume of the mixture during the extraction was taken as three-fourths of the final volume, which was made up subsequently.

The finely-ground sample was mixed in a flask with the required amount of water, and the stoppered flask fixed radially on a rotating wheel and shaken for 6 hours, after which the volume was made up and the whole filtered. The nitrogen was then determined in the filtrate, both directly and after boiling, to remove coagulable substances; the volume of the dried residue was then calculated from its weight and specific gravity and the results expressed with reference to the original dry barley.

Extraction with 5 per cent. sodium chloride solution instead of water caused a marked increase in the nitrogenous matter extracted. The addition of salicylic acid to the water exerted no restricting action on proteolysis during prolonged extractions.

The following table gives the results obtained, under the above conditions, with a mellow, thin-skinned Wiltshire barley and the malt prepared from it.

Solvent.	Percentage of nitrogen extracted in six hours from dry barley or its malt equivalent.			Percentage of nitrogen calculated on amount present in 20 grams of original barley (dry).		
	Total.	Co-agulable.	Non-co-agulable.	Total.	Co-agulable.	Non-co-agulable.
Barley:						
Water	0·251	0·090	0·161	14·7	5·3	9·4
5% NaCl solution	0·388	0·128	0·260	22·8	7·5	15·2
Malt:						
Water	0·523	0·142	0·381	30·7	8·3	22·4
5% NaCl solution	0·669	0·212	0·457	39·3	12·5	26·8

With air-dried malt, it is possible that a certain amount of proteolytic action occurs during the standard 6 hours' extraction.

T. H. P.

Iodine Value of Unsaturated Organic Compounds. HARRY INGLE (*J. Soc. Chem. Ind.*, 1904, **23**, 422—428).—The results of the work described confirm the conclusions arrived at in a previous paper (Abstr., 1902, i, 528), and also show that the amount of acid formed probably depends on the ionisation and subsequent hydrolysis of the iodochlorides by the water present. The amount of this hydrolysis is dependent on the nature of the groups attached to the double linking. The presence of aromatic groups and of negative groups in an unsaturated compound attached to the ethylene linking tend to lessen its attraction for iodine chloride in proportion to their negative character. The iodochlorides are further proved to be reduced by the action of aqueous potassium iodide, and this reduction is considered to be a fertile source of error in the estimation of the iodine values of unsaturated compounds. By estimating the iodine value of a substance by the various solutions (Hübl, Wijs, &c.) and the amount and nature of the acid produced by the hydrolysis, some information may be obtained as to the position of the ethylene linkings in the molecule. The triply-linked carbon pairs seem to exert less attraction for iodine chloride than the doubly-linked.

W. P. S.

Iodine Absorption of Oil of Turpentine. THOMAS F. HARVEY (*J. Soc. Chem. Ind.*, 1904, **23**, 413—414).—The author finds that the quantity of halogen absorbed by oil of turpentine from Wijs's solution is governed by the excess of solution used and also by the character of the excess halogen present in the Wijs solution, that is, whether iodine or chlorine is present in addition to iodine monochloride. The time of contact has also some slight effect on the amount absorbed. Solutions containing an excess of chlorine gave considerably higher values than others in which iodine was in excess.

W. P. S.

Characteristics of some Almond and Allied Oils. JULIUS LEWKOWITSCH (*Analyst*, 1904, **29**, 105—110).—The results of analyses of several samples of almond oils, apricot kernel oils, and peach kernel oils of undoubted genuineness are given. From the figures obtained, it is seen that these oils cannot be distinguished from each other by means of their chemical and physical constants. As regards the colour reactions, Bieber's test was the only one that gave any indications. This test consists in treating 5 parts of the oil with 1 part of an equal mixture (by weight) of sulphuric acid, fuming nitric acid, and water. Pure almond oil does not change colour, whilst peach kernel oil assumes a peach-blossom tint. The phloroglucinol test (Abstr., 1903, ii, 114) was found to be untrustworthy. W. P. S.

Tunisian Olive Oil. E. MILLIAU (*Chem. Centr.*, 1904, i, 1026—1027; from *Bull. Direction Agric. et Comm. Tunis*, 1903, 493).—Bellier and Kreis's colour reactions with a solution of resorcinol in benzene or of phloroglucinol in ether are to be preferred in the case of Tunisian olive oil to Becchi and Baudouin's tests, which give a yellow coloration with the unadulterated oil. The presence of earth nut oil is detected by Bellier's method. A mixture of adulterated or of pure Tunisian oil with an equal volume of glacial acetic acid at 100° forms a clear solution, but if colza oil is present the solution on cooling becomes turbid, whilst the pure oil under similar conditions remains clear even at much lower temperatures. The iodine number is determined by Bellier's method, of which details are given in the original. The results obtained by this method are more accurate in the case of solid fats than of oils, the values found in the latter case being generally too high. A method of estimating the iodine number by measuring the rise of temperature with a mixture of 1 gram of oil and 10 c.c. of chloroform or acetic acid is also described in the original paper. The presence of hydrocarbons is detected by determining the portion which is not hydrolysed by a concentrated solution of potassium hydroxide. Oils from Sfax and Tunis have been saponified and the fatty acids converted into dihydroxystearic acid by the action of potassium permanganate. In order to determine the acetyl number, the fatty acids were boiled with acetic anhydride, the product hydrolysed by potassium hydroxide, and the acetic acid, obtained by adding sulphuric acid and distilling in steam, was estimated by titration. By this method, the simultaneous formation of fatty anhydrides is avoided. Sfax olive oil has an acetyl number 262, the Tunis oil 203, and pure ricinus oil 153.

E. W. W.

Quantitative Separation of the Pyridine Bases from Ammonia and the Aliphatic Amines. JAR. MILBAUER and VL. STANĚK (*Zeit. anal. Chem.*, 1904, 43, 215—222).—Ammonia and the aliphatic amines combine directly with carbon dioxide, but the pyridine bases do not. If, therefore, a mixture of these is treated with carbon dioxide and calcium chloride, or their salts with calcium hydroxide, the ammonia and amines are converted into chlorides (by reaction of their carbonates with the calcium salt), whilst the pyridine bases remain free and can be extracted with ether. The extraction is, however, tedious. A more rapid and equally efficacious method depends on the insolubility of ammonium carbonate in ether. The solution containing ammonia, aliphatic amines, and pyridine is accurately neutralised, saturated with sodium chloride, mixed with an excess of saturated sodium hydrogen carbonate solution, and shaken twice for 15 minutes with an equal volume of ether.

The pyridine in the ethereal solution can then be accurately titrated by *N*/10 sulphuric acid, using as indicator Patent Blue VN superfine. This indicator is green in presence of the excess of acid added, but turns blue sharply when the excess is exactly neutralised by *N*/10 alkali.

M. J. S.

Arsenical Sulphuric Acid as an Alkaloidal Reagent. LEOPOLD ROSENTHALER and F. TÜRK (*Chem. Centr.*, 1904, i, 1106; from *Apoth. Zeit.*, 19, 186—187).—A solution of 1 gram of potassium arsenate in 100 c.c. of sulphuric acid is stated by the authors to be a special reagent for the identification of opium alkaloids. It must, however, be remembered that hydrastine and hydrastinine behave somewhat like narcotine. Cryptopine, papaverine, and thebaine also give the same reactions with pure sulphuric acid alone. If 0·1 mg. of the alkaloid is mixed with 0·1 gram of oxalic acid and then gently heated with 1 gram of the reagent, the following effects are noticed: morphine, grass-green to bluish-green; apomorphine yellowish-green to grass-green; dionine, grass-green, heroine, grass-green to bluish-green; narcotine, purple to carmine; codiine, blue to violet. For further particulars, the original paper should be consulted.

L. DE K.

The André [Thalleoquinine] Reaction for Quinine.

EUGÈNE LÉGER (*J. Pharm. Chim.*, 1904, [vi], 19, 281—284).—Small quantities of quinine may, as is well known, be detected by the green colour produced on adding chlorine or bromine water, and then ammonia.

It appears from the author's experiments that if bromine water is employed this should be added very cautiously, as an excess will prevent the reaction altogether. Used with care it is, however, a very delicate test.

L. DE K.

Evaluation of Quinine by André's Reaction.

EUGÈNE LÉGER (*J. Pharm. Chim.*, [vi], 19, 434—435).—A criticism of the process for testing cinchona bark described in both the Swiss and Italian pharmacopœias. The depth of coloration caused by the action of bromine water and ammonia is a quite untrustworthy guide for judging the amount of quinine.

L. DE K.

Estimation of Quinine in the presence of Other Cinchona Alkaloids.

EUGÈNE LÉGER (*J. Pharm. Chim.*, [vi], 19, 427—434. Compare Abstr., 1902, i, 549).—Quinine cannot be quantitatively separated from cinchonidine by ether. Crystallisation as sulphate only succeeds when the quinine strongly predominates, and Oudeman's polarisation process may fail in practice on account of the co-precipitation of other tartrates besides quinine and cinchonidine.

The object may, however, be successfully attained by first purifying the sulphates by recrystallisation from boiling water (previously saturated in the cold with quinine sulphate). A portion of the product so obtained is dissolved in boiling water, previously saturated in the cold with both quinine and cinchonidine tartrates. A calculated amount of potassium sodium tartrate is added, and, after 24 hours, the mixed tartrates of quinine and cinchonidine are collected on a tared filter, washed with a cold-saturated quinine tartrate solution, then with a very little water, air-dried, and weighed. The quinine tartrate contained therein may now be accurately determined by observing its rotatory power xm, and applying Oudeman's formula, $215{\cdot}8 \times 2 + 131{\cdot}3(100 - x) = 100 \times dm$.

L. DE K.

Xanthine Bases contained in Meat, Yeast, and other Extracts. II. The Xanthine Bases of Yeast Extract.

KARL MICKO (*Zeit. Nahr. Genussm.*, 1904, 7, 257—270).—A somewhat similar method to that described under meat extract was employed (Abstr., 1902, ii, 369; 1903, ii, 101). Three hundred grams of yeast were boiled with 2300 c.c. of water and 200 c.c. of dilute sulphuric acid (1 : 3). The hydrochloric acid solution of the bases obtained from the copper hydrogen sulphite precipitate was evaporated and treated with ammonia for 12 hours. The precipitate formed (Fraction I) was separated and washed. After precipitating the filtrate with silver solution and removing the silver from the precipitate, the hydrochloric acid solution of the bases in the latter was evaporated and the residue obtained treated with boiling picric acid solution. The precipitate (Fraction II) was collected in a filter, and evaporation of the filtrate yielded further amounts of bases (Fractions III and IV). These fractions were purified and refractionated. Fraction I consisted principally of guanine, traces of adenine, xanthine, and hypoxanthine also being present. Adenine was the only base detected in Fraction II. In comparison with the other fractions, Fraction III contained the largest quantity of xanthine. Besides the latter, hypoxanthine was present, together with small amounts of guanine and adenine. Fraction IV consisted mainly of hypoxanthine, mixed with traces of xanthine, adenine, and guanine. Adenine is the chief constituent of the xanthine bases found in yeast extract, then follow guanine, hypoxanthine, and xanthine. Carnine was not detected. W. P. S.

Decomposition of Tannin Solutions. Edouard Nihoul and L. van de Putte (*Chem. Centr.*, 1904, 1, 840—841; from *Bull. Assoc. Belge des Chimistes*, **17**, 390—398).—Experiments showing that infusions of oak bark, pine bark, and sumach rapidly deteriorate, which may cause discrepancies in analysis. In the case of oak bark, the decomposition may be retarded by addition of a little thymol.

L. de K.

Behaviour of Certain Organic Compounds towards Blood, especially as regards the Detection of Blood. Oskar Adler and Rudolf Adler (*Zeit. physiol. Chem.*, 1904, **41**, 59—67).—Tabulated results are given of a number of experiments, in which the colour reactions of various aromatic amines, and acids, and of phenols of the diphenyl and naphthalene series, with blood in the presence of hydrogen peroxide are compared. It was found that the higher members of the series exhibited the greater sensibility. Catechuic acid and benzidine would detect 1 part of blood in 100,000 parts of water, or 0·001 per cent.

A solution of pure leuco-base of malachite-green (tetramethyldiaminotriphenylmethane) in glacial acetic acid is also an extremely sensitive reagent, giving an intense green coloration with solutions containing 0·001 per cent. of blood, after the addition of a little hydrogen peroxide. In preparing the reagent, it is advisable to shake the acetic acid solution with an equal volume of chloroform, and then to add water cautiously until the latter separates. Any green coloration which the original solution may have is thus removed. In testing urine for blood, about 15 c.c. of the urine are extracted with ether, the ethereal layer is drawn off, and then treated with hydrogen peroxide and the reagent. In the case of fæces, a little of the latter is mixed with water and the unfiltered solution tested with an alcoholic solution of benzidine in the presence of hydrogen peroxide and a drop of acetic acid, an intense green colour being produced should blood be present. W. P. S.

Detection of Urobilin in Urine. Léon Grimbert (*J. Pharm. Chim.*, [vi], 19, 425—426).—Thirty c.c. of urine are mixed with 20 c.c. of Dénige's reagent, and after 5 minutes the filtrate is agitated in a separating funnel with 5 c.c. of chloroform. The chloroform is introduced into a test-tube, and Roman and Delluc's reagent is added as long as it produces a turbidity (10 drops are usually required). The moment the liquid becomes clear, the characteristic green fluorescence will be noticed.

Preparation of the reagents.—Dénige's solution is prepared by dissolving 5 grams of yellow oxide of mercury in 100 c.c. of water and 20 c.c. of pure sulphuric acid. Roman and Delluc's solution is made by dissolving 10 grams of zinc acetate in 100 c.c. of 95 per cent. alcohol and a few drops of acetic acid. L. de K.

Estimation of Bile Salts. Otto Grünbaum (*Trans. Pathol. Soc. Sweden*, 1904, 55, 55—59).—A full account of the method previously described (this vol., ii, 103). W. D. H.

Estimation of the Proteolytic Capacity of Malt. Philip Schidrowitz (*J. Inst. Brewing*, 1904, 10, 166—172).—In order to obtain concordant results in this estimation (Abstr., 1903, ii, 680), particular attention should be paid to the quality of the gelatin used. The latter should be neutral or slightly acid to litmus. Alkaline gelatins must be rejected. To prepare a standard gelatin solution, about 3 grams of the sample are dissolved in 200 c.c. of water and titrated with $N/10$ sodium hydroxide solution, using phenolphthalein as indicator. Sixty-four grams of the gelatin are then dissolved in 500 c.c. of hot water (measured at 15°), an amount of $N/10$ sodium hydroxide solution, as determined in the preliminary titration, is added, and the whole diluted to 736 c.c. After cooling to about 45°, the white of an egg is added, the mixture is heated to 90° on a water-bath, filtered through paper, and cooled to 60°, when 4 grams of powdered thymol are added. The jelly is kept in well-stoppered bottles. The quantities of water mentioned above refer to gelatins containing 16·8 per cent. of water. W. P. S.

General and Physical Chemistry.

Spark Spectrum of Radium. Carl Runge and J. Precht (*Ann. Physik,* 1904, [iv], 14, 418—422. Compare Abstr., 1903, ii, 346, 621).—The authors have used a purer specimen of radium bromide than was available in their earlier work, and have observed a number of new lines, especially in the red part of the spectrum. J. C. P.

Penetrating Rays of Radium. Friedrich Paschen (*Ann. Physik,* 1904, [iv], 14, 164—171).—It is shown that the γ-rays from radium are like the β-rays in that they carry negative electricity with them. The former, however, are absorbed to a much smaller extent, and so the velocity of the γ-radiation is probably greater than that of the β-radiation. The highest velocity hitherto deduced for the latter has been about 1/18th that of light, and it is therefore possible that the case of electricity moving with the velocity of light may be realised in the γ-rays. J. C. P.

Cathode Rays of Radium. Friedrich Paschen (*Ann. Physik,* 1904, [iv], 14, 389—405).—A quantitative study of the behaviour of the γ-rays in a magnetic field bears out the view recently adopted (preceding abstract) that these are cathode rays of very high velocity. J. C. P.

Radioactive Substances in Relation to the Presence of Helium. Raffaelo Nasini (*Atti R. Accad. Lincei,* 1904, 13, i, 367—368).—Barium sulphate prepared from the Abano deposits has at first but slight radioactivity, which, however, increases very considerably after a time. The same is the case with the chloride prepared from the sulphate. By treating this chloride, after it has reached its maximum activity, with sodium amalgam and preparing the active chloride from the amalgam thus obtained, an increase is obtained in the activity, which, by repetition of this process, may attain a value seven times as great as that of the original chloride. Other products, such as the incrustations, from the Abano springs are, under these same conditions, either more or less active than the deposits, but are less convenient to concentrate than the latter.

Both the gas from the soffioni, and the emanations from the rocks, at Larderello are appreciably radioactive and the activity diminishes as time goes on, but the diminution does not appear to proceed in agreement with that observed for radium emanations. T. H. P.

Radioactivity of the Gases evolved from the Waters of Thermal Springs. Pierre Curie and A. Laborde. (*Compt. rend.,* 1904, p. 1150—1153).—Each gas was enclosed in a cylindrical brass condenser and the saturation current measured in the usual manner. In every case it was observed that the current increases rapidly for some hours after the introduction of the gas; a maximum value is reached, after which the current strength gradually falls until, in about twenty-four hours, the rate of decay is the same as that shown by radium emanation. A list of the gases examined is given, together with the value in electrostatic units of the current four days after the gas had been collected from the spring, whilst a second column shows the number of minutes during which 1 mg. of radium bromide must be allowed to remain in 1 litre of air to give the same current as that found for the gas.

The dissolved gases were also investigated. Some waters, those from Plombières and Luxeuil, for instance, were found to contain about as much emanation in 10 litres as would be disengaged by 1 mg. of radium bromide in 1 minute. Further, it was observed that the same waters gave a much smaller amount of emanation when examined two months after being collected; this fact shows that the radioactivity which they contain cannot be due to dissolved radium bromide, but must be ascribed to some more remote cause. S. S.

Radioactivity and Matter. CLEMENS WINKLER (*Ber.*, 1904, 37, 1655—1662).—The results obtained by investigators of radioactivity are critically discussed, and a note of caution is sounded against too ready acceptance of supposed new elements. Attention is drawn to the very slight character of the chemical evidence available, and to the fact that radioactivity is invariably associated with uranium. It is suggested that radioactivity may be a purely physical phenomenon, manifesting itself through matter, but without influence on its chemical nature. A parallel case is suggested in the magnetism of ferrosoferric oxide, which can be intensified, transferred, apparently destroyed, and reproduced, like radioactivity; no one, however, supposes that magnetic ferrosoferric oxide contains an element not present in non-magnetic ferric oxide. Only when pure radioactive substances are obtained in larger quantities, and when their chemical behaviour is definitely characterised, can the existence of special radioactive elements be regarded as established. J. C. P.

Emanation Substance. Emanium. FRITZ GIESEL (*Ber.*, 1904, 37, 1696—1699. Compare Abstr., 1903, ii, 193).—According to an investigation of the spark spectrum by Runge and Precht, the emanation substance previously described (*loc. cit.*) consists chiefly of lanthanum with a little cerium. The dehydrated chloride and bromide phosphoresce (the sulphate to a less extent), and show a discontinuous phosphorescence spectrum of three lines, situated at about equal intervals between red and bluish-green. Glass vessels in which the substance has been kept for a few months are coloured violet, so far as the contact has extended. Paper similarly exposed becomes brown and falls to pieces. The activity of the solid salts reaches its maximum about a month after they have been separated from solution, and thereafter remains unchanged (compare the behaviour of radium, Abstr., 1900, ii, 19). This behaviour is characteristic of primarily radioactive elements, and the author accordingly supposes that there is in the "emanation substance" a strongly radioactive element, most probably allied to lanthanum, for which the name *emanium* is proposed. The slight activity of commercial uranium salts is due more likely to traces of emanium than of radium. The strongly active lead preparations previously described (Abstr., 1902, ii, 208) derived their activity most probably from the emanation substance.

Barium sulphate, precipitated from a solution containing slightly active noble earths, is more strongly active than these. So also the activity of barium bromide containing emanium can be concentrated by fractional crystallisation, as in the case of the barium-radium mixture. This barium bromide, when anhydrous, exhibits strong phosphorescence; its spark spectrum is quite distinct from that of an equally active barium radium bromide. The activity of the best emanium preparations is very great, and the scintillations produced at a zinc blende screen are larger and more distinct than in the case of radium. J. C. P.

Action of Canal Rays on Zinc Oxide. II. JULIUS TAFEL (*Ann. Physik*, 1904, [iv.], 14, 206—207).—A reply to Schmidt (this vol., ii, 307). J. C. P.

Reversible Photochemical Reactions in Homogeneous Systems. I. Anthracene and Dianthracene. ROBERT LUTHER and FRITZ WEIGERT (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 828—839).—When a boiling solution of anthracene in phenetole is exposed to the light of an arc lamp, dianthracene (m. p. 270—280°) is formed in considerable quantity. On the other hand, when dianthracene is suspended for about 20 hours in boiling phenetole, light being excluded, it is transformed completely into anthracene and is dissolved. Similar results are obtained in boiling anisole and boiling xylene.

The conversion of dianthracene into anthracene when dissolved in phenetole or anisole has been studied quantitatively and found to conform to the equation for a unimolecular reaction.

When boiling solutions of anthracene and dianthracene are exposed to light, a condition of equilibrium is reached in a few hours. The concentration C of the dianthracene at the point of equilibrium is (1) inversely proportional to the square of the distance from the lamp; (2) directly proportional to the relative intensity of the light; (3) proportional to the surface area exposed to the light; (4) from 1 mm. upwards, independent of the thickness of the liquid layer through which the light passes; (5) inversely proportional to the volume or weight of the solution; (6) nearly independent of the anthracene concentration at the point of equilibrium. C varies also with the nature of the illumination, and with the solvent used, but for a given source of light, a given solvent and a given temperature, an empirical formula can be found which gives values of C in good agreement with experiment. J. C. P.

Spark Potential in Chlorine, Bromine, and Helium. F. RITTER (*Ann. Physik,* 1904, [iv], 14, 118—128).—The ratios V_{Cl}/V_{air}, and V_{Br}/V_{air}, where V is the spark potential, are not constant, but gradually increase with increasing sparking distance (δ) and increasing gas pressure (P), ultimately approaching limiting values. The ratio V_{He}/V_{air}, on the other hand, diminishes as δ and P increase, and it is found that the curves obtained by plotting spark potential against sparking distance, which are concave to the horizontal axis for all other gases, are straight lines in the case of helium. These lines cut the vertical axis at the point 300 for all pressures, indicating a constant resistance to be overcome between the helium and the electrode.

J. C. P.

Significance of the Maximum in the Conductivity Curves of Kraus at High Temperatures. HARRY C. JONES (*Amer. Chem. J.*, 1904, **31**, 584—585).—An investigation of the conductivity of solutions of electrolytes in methyl and ethyl alcohols has been made recently by Kraus (*Phys. Rev.*, 1904, **18**, 40), and it has been shown that the conductivity passes through a maximum with rise of temperature which in the case of solutions in methyl alcohol occurs at 150° and in that of ethyl alcohol solutions at about 100°.

The present paper draws attention to these results, and points out that there are two influences exerted on the conductivity with rise of temperature, namely, an increased rapidity of movement of the ions and a decrease in the association of the solvent. The maximum in the conductivity curve represents the temperature at which these opposite influences become equal.

E. G.

Study of Hydrolysis by Conductivity Methods. JULIUS STIEGLITZ and IRA H. DERBY (*Amer. Chem. J.*, 1904, **31**, 449—458).—The proportions of free acid, free base, and salt in aqueous solutions of the hydrochlorides of weak bases can be determined most rapidly by a method based on conductivity measurements. It has been shown by Walker (Abstr., 1890, 5) that in such cases the percentage of salt x which has suffered hydrolysis can be calculated from the observed molecular conductivity, M_v, by means of the equation

$$x = M_v - \mu_v/\mu_{HCl} - \mu_v,$$

where μ_v and μ_{HCl} represent the conductivity of the non-hydrolysed salt and the free acid respectively. Various interpretations have been given by different workers to the value of μ_{HCl} in this equation. It is regarded by Walker as representing the molecular conductivity of the acid for the original concentration of the salt solution, that is, for a completely hydrolysed salt, and this view is adopted in the present paper. Experiments have been made to test the trustworthiness and range of accuracy of the equation in the analysis of mixtures of hydrochloric acid and potassium chloride of varying concentrations, but especially $N/32$ solutions of each, and also in the determination of the conditions of equilibrium in solutions of aniline hydrochloride containing an excess of hydrochloric acid.

The results indicate that this method of analysis of hydrolysed solutions can be used successfully in the case of solutions undergoing continuous change and has the advantage of great rapidity. It has been applied to the determination of the velocities of rearrangement and the affinity constants of certain aminophenyl alkyl carbonates (Stieglitz and Upson, this vol., i, 575).

E. G.

Formation of Electrolytic Gas by an Alternating Current. Ralph G. van Name and Leopold Gräfenberg (*Zeit. Elektrochem.*, 1904, 10, 303—309).—The following substances were used as electrodes in the electrolysis of sulphuric acid (20 per cent. H_2SO_4) with a current alternating 110 times per second; carbon, graphite, silicon, lead, tin, platinum, gold, aluminium, and platinum-iridium. The same substances with the exception of the two last and also silver, nickel, iron, copper and zinc, were tried with 28 per cent. potassium hydroxide. Carbon and graphite were pulverised, silicon and aluminium gave large anodic resistances in acid solution, and in alkaline solution silicon was rapidly dissolved. Lead and tin in acid solution and lead, tin, and zinc in alkaline solution were rapidly acted on. With the other metals, the yields of electrolytic gas and the *E.M.F.* required were determined. The yield of electrolytic gas increases with the current density, but since the *E.M.F.* also increases in about the same ratio, the energy efficiency remains approximately constant. Platinum gives the best results, gold being almost as good, but in both cases the surface of the metal is disintegrated and small quantities pass into solution. The disintegration of the surface diminishes the yield of gas. Silver in alkaline solution is less acted on than any other metal tried. Copper, iron and nickel are all oxidised more or less energetically. The largest energy efficiency observed is about one-half of that attainable with direct current; this is mainly due to the very high current density, which must be employed with alternating current (1·7 to 20 amperes per sq. cm.). There appears to be no electrode material which is unacted on under these conditions. T. E.

Employment of Alternating Currents in Chemistry and the Reactions which they Determine. Marcellin Berthelot (*Compt. rend.*, 1904, 1130—1133).—The author recalls some experiments made by him in 1879 with the object of ascertaining the effect of an alternating current on solutions of dextrose. The simultaneous oxidation and reduction of the sugar were thus studied, and it was found that alcohol and carbon dioxide were produced; this action may be compared to the alcoholic fermentation of sugar. Other instances quoted are: the oxidation of an aldehyde in alkaline solution in presence of air, the oxidation of silver in presence of sodium chloride and air, and the action of potassium cyanide on platinum recently observed by Brochet and Petit (Abstr., 1904, ii, 229).

S. S.

Concentration of Mercury Ions in the Calomel Electrode and the Solubility of Calomel. Heinrich Ley and Chr. Heimbucher (*Zeit. Elektrochem.*, 1904, 10, 301—303).—The published values of the solubility of calomel vary from 1×10^{-6} to 6×10^{-6}. The authors find, by the sugar inversion method, that about 3·4 per cent. of the mercurous perchlorate contained in a $0·1N$ solution of that salt is hydrolysed. The electrolytic conductivity of solutions of barium perchlorate is determined and the assumption made that the dissociation of a solution of mercurous chlorate is the same. In this way, it is calculated that the concentration of the mercurous ions ($Hg_2^{\cdot\cdot}$) in a 0·1*N* solution of mercurous perchlorate is 0·035. The *E.M.F.*'s of cells consisting of combinations of the 0·1*N* and *N* calomel electrodes with a 0·1*N* solution of mercurous perchlorate are then measured; the mean values found are 0·420 and 0·472 volt respectively. From these values, the concentrations of the mercurous ions ($Hg_2^{\cdot\cdot}$) at the electrodes are $2·0 \times 10^{-16}$ and $3·5 \times 10^{-18}$ respectively, and assuming the saturated solution of calomel to be completely dissociated, the solubility of calomel is $0·8 \times 10^{-6}$. T. E.

Velocities of the Ions in Liquid Ammonia Solutions. Edward C. Franklin and Hamilton P. Cady (*J. Amer. Chem. Soc.*, 1904, **26**, 499—530).—A form of apparatus has been constructed by the authors by means of which the absolute velocities of certain ions in liquid ammonia have been determined. The velocities of a number of univalent ions in liquid ammonia at −33° are from 2·4 to 2·8 times as great as they are in aqueous solutions at 18°, and are in agreement with the velocities calculated from conductivity measurements by Kohlrausch's method. Whilst the dissociating power of liquid ammonia is comparatively low, the speed with which the ions migrate is exceptionally high. Experiments were made with solutions of ammonium nitrate, ammonium iodide, potassium nitrate, sodium nitrate, sodium bromate, and silver nitrate, respectively, in liquid ammonia, where the speed of the cathion was measured; the speed of the anion was measured with solutions of ammonium nitrate, potassium nitrate, ammonium chloride, sodium nitrate, sodium chloride, ammonium bromide, sodium bromide, ammonium iodide, and potassium iodide respectively. The tabulated results show that the assumption that the speeds of the ions are independent of the degree of dilution is justified in the cases of ammonium nitrate, potassium nitrate, sodium chloride, and sodium bromide. In solutions of ammonium chloride and ammonium bromide, there is obviously a rapid increase in the transport number of the ion with the concentration. The behaviour of ammonium iodide is similar but less marked. A. McK.

Electric Osmosis in Methyl Alcohol. A. Baudouin (*Compt. rend.*, 1904, 1165—1166).—The present communication deals with the influence of polyvalent ions on the charge assumed by the cell-wall in contact with methyl alcohol. The influence of certain univalent ions has already been described (this vol., ii, 380). A polyvalent ion has little or no effect on a similarly charged cell-wall, but if the charge on the latter is of opposite sign to that of the ion, it is diminished, and in some cases reversed. S. S.

Specific Heat of Carbon at High Temperatures. Ludwig Kunz (*Ann. Physik*, 1904, [iv], 14, 309—333).—Using a small electrical resistance oven and an ice calorimeter, the author has determined the specific heat of wood charcoal at temperatures between 400° and 1300°. The following are the values obtained:

435°	0·243	928°	0·359
558	0·290	932	0·358
564	0·290	1059	0·362
716	0·331	1192	0·376
739	0·324	1202	0·380
920	0·357	1297	0·381
921	0·359		

These values are not very different from those given by Weber for graphite. J. C. P.

A New Pyrometer. CHARLES FÉRY (*Bull. Soc. chim.*, 1904, [iii], 31, 701—702. Compare Abstr., 1903, ii, 124 and 293).—The apparatus consists of a lens made of a diathermanous substance, such as rock-salt or fluorspar, bearing cross-wires—one of iron and the other of "constantan" (an alloy of copper and nickel), which together constitute a thermo-electric couple. The current generated by the exposure of this to the radiation from the source of heat is measured by a galvanometer. For industrial purposes the lens may be of glass, and the instrument is then graduated by comparison with one having a lens of rock-salt. T. A. H.

Boiling Points of Homologous Compounds. HUGH RAMAGE (*Proc. Camb. Phil. Soc.*, 1904, 12, 445—448).—To connect the boiling points and the molecular weights of the fatty hydrocarbons, the author suggests the formula $T=a[M(1-2^{-n})]^{\frac{1}{2}}$, where n is the number of carbon atoms in the molecule. The constant a is the same as in the similar formula brought forward by Walker (Trans., 1894, 65, 193, 725), but it is also given by the expression $a=23{\cdot}5P^{{\cdot}07}$, where P is the pressure. Walker's formula is not valid over such a wide range as the author's formula, by which the boiling points of the hydrocarbons from methane to hexadecane may be calculated with a maximum error of 3·9° in the case of propane.

The boiling points of the first eight members of the normal alcohol series may be calculated by the formula $T=286{\cdot}2+1{\cdot}41\,M$; the errors are small, except in the case of methyl alcohol.

For the boiling points of aldehydes the equation $T=209{\cdot}14+1{\cdot}9286\,M$ may be used; for ketones the equation $T=250{\cdot}07+1{\cdot}4643\,M$.
J. C. P.

Sydney Young's Law of Distillation. (Miss) J. REUDLER (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 6, 807—809).—Young's law of fractional distillation (Trans., 1902, 81, 752) is criticised and experimentally tested with a mixture of benzene and aniline, which presents a mixture with a very steep Tx-line. The conclusion is drawn that Young's rule is a proof of the excellent way in which Young's still-heads work, but that, from the point of view of quantitative analysis, this rule must only be taken as an application of the most obvious operation, namely, that of separating a substance in the pure state from a mixture and then weighing it separately.

A. McK.

A New Dephlegmator for Fractional Distillation and for Reflux Distillation. Josef Houben (*Chem. Zeit.*, 1904, 28, 525—527).—An improved form of Winssinger's apparatus. A. McK.

Heats of Combustion of Some Organic Compounds. Emil Fischer and Franz Wrede (*Situngsber. K. Akad. Wiss. Berlin*, 1904, 687—715).—The author's experiments have been made with a slightly modified Berthelot bomb, the heat capacity of which, along with the calorimeter, has been determined by an electrical method. The substances employed were of a high degree of purity, and details of their preparation and purification are given in the paper. The following numbers represent the molecular heats of combustion at constant volume in Cal.; benzoic acid, 775·3; naphthalene, 1237·5; sucrose, 1363·9; phenylacetic acid, 933·4; glycine, 234·1; alanine, 390·3; leucine, 858·5; glycine anhydride, 476·7; alanine anhydride, 788·4; leucinimide (3 : 6-*di*iso*butyl*-2 : 5-diketopiperazine), 1726·2; glycylglycine, 472·4; glycylglycine ethyl ester, 805·3; glycylglycinecarboxylic acid, 473·7; α-carbethoxyglycylglycine ethyl ester, 1123·2; β-carbethoxyglycylglycine ethyl ester, 1094·8; leucylglycylglycine, 1335·9; *iso*serine (β-aminolactic acid), 344·5; aspartic acid, 387·1; glutamic acid, 544·2; phenylglycine, 957·8; anilinoacetic acid, 967·9; benzoylaminocinnamic anhydride, 1858·3; benzoylaminocinnamic acid, 1854·5; benzoylphenylalanine, 1895·9; phenylalanine, 1114·1; barbituric acid, 360·7; diethylbarbituric acid, 985·9: silk fibroin, 5167·9 (cal. per gram); 4-methyluracil, 567·7; 5-methyluracil (thymine), 566·4; 4-methylhydrouracil, 619·6; phenyluracil, 1134·9; hexoic acid, 839·6; hydrosorbic acid, 797·0; sorbic acid, 745·9. The heats of combustion of twelve of these compounds have been previously determined, chiefly by Stohmann, Berthelot, and his pupils. In most of these cases there is a satisfactory agreement between the authors' values and the earlier ones. From eight pairs of compounds in the foregoing list, it is shown that the molecular heat of combustion increases by 155·9—158·1 Cal. for each addition of CH_2. Similarly, the increase in the molecular heat of combustion for an addition of 2H is found in five cases to be respectively 41·4, 51·9, 42·6, 45·6, and 48·6 Cal. The increase of the heat of combustion for 2H is greater in the pair sorbic acid—hydrosorbic acid than in the pair hydrosorbic acid—hexoic acid, a result that agrees with Thiele's views (Abstr., 1899, i, 554). The increase of the heat of combustion corresponding with the introduction of the NH_2 group is found in three cases to be 24·4, 28·6, 29·3 Cal. The introduction of the phenyl group means an increase of 723·8 Cal. in the heat of combustion. The thermal value of the anhydride formation in the case of the amino-acids indicates that the formation of these polypeptides and diketopiperazines from amino-acids is accompanied by absorption of heat. The difference between the heats of combustion for isomerides is specially noteworthy in the case of α- and β-carbethoxyglycylglycine ethyl esters. J. C. P.

Temperature Variation of the Coefficient of Expansion of Pure Nickel. E. PHILIP HARRISON (*Phil. Mag.*, 1904, [vi], 7, 626—634).—Between 365° and 370°, the coefficient of thermal expansion of pure nickel wire undergoes a sudden change, which is of the same magnitude and occurs at the same temperature whether the temperature of the wire is rising or falling. The change is not modified by successive heatings and coolings, neither is the wire permanently elongated. The wire was heated by a current and its temperature was deduced from its electrical resistance. J. C. P.

Density of Aqueous Salt Solutions Considered as Additive Properties of the Ions, the Existence of Hydrated Ions. P. VAILLANT (*Compt. rend.*, 1904, 138, 1210—1213).—If at $t°$, s_0 be the density of water, S that of an aqueous solution containing n gram-equivalents of a substance of equivalent E, k the number of equivalents of water associated with each equivalent of the dissolved substance, ϕ the volume per gram-equivalent of the hydrate in solution, N the number of equivalents of water per litre of the solution, then $(E+k\times 9)/s_0-\phi = 1000(s/s_0-1)/n=A$. From a consideration of the values of A for various ions, the following conclusions are drawn; (1) two ions unite to form an electrolyte without any appreciable contraction; (2) in general the ions are anhydrous ($k=0$). The polyvalent ions have a small volume ($E-A$) and a large density $E/(A-E)$; the univalent anions have a density of about 5, the univalent cathions a density of about 2; hydrogen, lithium, and ammonium are exceptions, the density of the first being about $\frac{1}{11}$, and of the two last $\frac{2}{3}$; (3) in the case of the cathions OH; F; $\frac{1}{2}$S; $\frac{1}{2}CO_3$, k is not zero, that is, the ions are hydrated, the residual valencies of the oxygen, sulphur, or fluorine atom uniting with the oxygen of the water molecule to form a hydrated ion of the type $H_2O{:}O{<}^{H}$. M. A. W.

Studies in Viscosity. CHARLES E. FAWSITT (*Electro-Chem., Metall.*, 1904, 3, 664—668).—The viscosity η of a solution containing several non-electrolytes is given by the equation $\eta=A^xB^yC^z$ . . . ., where x, y, z, ... are the concentrations of the substances with viscosity constants A, B, C . . . . Extending this relationship to electrolytes, the author shows that if a strong base XOH and a strong acid HY could be mixed in equivalent quantities without chemical action taking place, the viscosity would be given by the product $\eta_{H^\cdot}\times\eta_{X^\cdot}\times\eta_{Y'}\times\eta_{OH'}$. Actually, the viscosity is given by $\eta_{X^\cdot}\times\eta_{Y'}$, and if this is divided into the calculated product just referred to, the value of $\eta_{H^\cdot}\times\eta_{OH'}$ is obtained. The value should be independent of the particular base and acid used, so long as they are both strong, and the author shows that this is very nearly the case when $N/2$HCl is neutralised by sodium hydroxide, potassium hydroxide, or tetramethylammonium hydroxide. Further, the value of $\eta_{H^\cdot}\times\eta_{OH'}$ thus obtained agrees with the product of the viscosity values for H˙ and OH′ in $N/2$ solution (see Euler, *Zeit. physikal. Chem.*, 1898, 25, 536). When a weak base is used to neutralise the strong acid, the above simple relation does not hold.

From experiments recorded in an earlier paper (this vol., ii, 323), and supplemented by later work, it appears that the viscosities of solutions of carbamide hydrochloride, and dimethylcarbamide hydrochloride are very nearly the same respectively as the values of the product $\eta_{\text{amide}} \times \eta_{\text{HCl}}$.

Experiments with (1) carbamide, methylcarbamide, ethylcarbamide, dimethylcarbamide; (2) acetamide, propionamide, and butyramide, have shown that the viscosity of molecular solutions is in the main an additive property. J. C. P.

Does the Application of Tyndall's Optical Method permit of the Demonstration of the Presence of Molecules in Solutions? CORNELIS A. LOBRY DE BRUYN and LUDWIG K. WOLFF (*Rec. trav. chim.*, 1904, 23, 155—168. Compare Abstr., 1900, ii, 136; 1902, ii, 646).—The authors review the work of Picton and Linder (Trans., 1892, 143), Spring (Abstr., 1899, ii, 537 and 585; 1900, ii, 713; 1901, ii, 297), Stoeckel and Vanino (Abstr., 1900, ii, 11), Zsigmondy (Abstr., 1898, ii, 522; 1900, ii, 397), Billitzer (this vol., ii, 18), and Muller (this vol., ii, 18) in its bearing on this subject. They have repeated Spring's experiments (Abstr., 1899, ii, 585) with various inorganic salts and organic substances, the solutions being clarified by precipitating zinc hydroxide or ferrocyanide in them. In order to avoid errors due to fluorescence, yellow light was employed. Under these conditions, solutions of inorganic salts in water showed no internal reflection and this was also true of carbamide, acetamide, and methyl and ethyl alcohols dissolved in water; on the contrary, solutions of sucrose and raffinose exhibited a slight internal reflection of polarised light, as did also phosphomolybdic acid. In the last case, the luminescence was probably in part due to hydrolytic dissociation, since, after a time, solutions of this material deposit molybdic acid. Organic substances of high molecular weight, such as stearin and the benzoic esters of mannitol, dulcitol, and raffinose, dissolved in organic solvents, were more luminescent than the solvents themselves. From these results, the authors conclude that in the case of substances of complex molecular structure the internal reflection of light in solutions may be due to diffraction of light by the molecules of the substance and that the phenomenon is not confined to substances, such as colloids, existing in "pseudo"-solution. This implies that there is continuity, so far as regards this phenomenon, between "true" and "pseudo"-solution. T. A. H.

Variations in Concentration of Solutions and the Crystallisation of Dissolved Substances under the Influence of "Centrifugal" Force. R. P. VAN CALCAR and CORNELIS A. LOBRY DE BRUYN (*Rec. trav. chim.*, 1904, 23, 218—223).—Gay-Lussac had observed that the influence of gravity did not induce unequal concentration in solutions, and, later, Gouy and Chaperon pointed out that this negative result was probably due to the feeble character of the force employed (Abstr., 1887, 1013). Courbes and subsequently Bredig (Abstr., 1895, ii, 490) had pointed out that "centrifugal" force should produce the same effect as gravitation in experiments of this kind, and the latter effected by this means the separation of hydrogen and hydrogen iodide. Experiments of this type with solutions have already been made or suggested by Colley, van't Hoff, and Quincke.

The authors employed a rotating drum with a cover carrying four test-tubes, one at the centre and the others placed at different distances from this ; these could be closed simultaneously by four rubber bungs, supported on a copper wire attached to a disc which could be moved along the longitudinal axis of the drum. By this means, samples of the liquid could be taken simultaneously at four different points in the cross section of the drum.

Solutions of potassium thiocyanate, ferrocyanide, and iodide, and of sucrose in water, were employed and in each case it was found possible to induce unequal concentration of the solution. Thus in the case of a solution of sucrose having originally a rotation of 46·8°, after being whirled at the rate of about 2000 revolutions per minute during four hours, the sample collected in the tube nearest to, but not at the centre of, the drum had a rotation of 41°, that in the next tube 51·5°, and that in the peripheral tube 47°. Normally, the most concentrated solution should be found in the peripheral tube ; the abnormality in the present instance is due to the production of a wave over the third tube when the disc is moved to enable the samples to be taken. Using a solution of sodium sulphate in water saturated at 9°, 3·75 per cent. of the salt was separated as the solid decahydrate by rotating the drum at the rate of about 2400 revolutions per minute for a period of five hours.

T. A. H.

Gelatinisation. III. Internal Friction of Colloidal Solutions. S. A. Levites (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 401—417. Compare Abstr., 1902, ii, 312, and 1903, ii, 641).—The author has investigated the relation between the changes brought about in (1) the velocity of coagulation of solutions of glutin, agar-agar, albumin, and casein (in alkali) by the addition to them of various substances and (2) the internal friction of the solutions. The results lead to the following conclusions. Colloidal liquids may be regarded as solutions, inasmuch as they consist of homogeneous mixtures of a liquid and a solid phase. Among solutions of colloids, those of organic colloids are most nearly allied to actual solutions ; metallic hydrosols are most probably pseudo-solutions. A jelly consists of a mixture of a solid and a liquid phase. Gelatinisation does not take place simultaneously with the attainment of equilibrium between these two phases, which only sets in very gradually after gelatinisation. The speed of gelatinisation in presence of a foreign substance depends on the influence exerted by that substance on the solubility of the colloid in question. The influence exerted by a foreign (crystalloid) substance on the internal friction of a colloidal solution depends on the influence of the substance on the internal friction of the solvent, but is independent of the nature of the colloid. More complex results are obtained when two or more colloids are present in one and the same solution.

T. H. P

Decomposition of Some Acid Sulphates as the Result of Mechanical Deformation. WALTHÈRE SPRING (*Rec. trav. chim.*, 1904, 23, 187—201. Compare this vol., ii, 313).—In conformity with the view previously expressed (*loc. cit.*) that substances under compression assume to some extent the properties of the liquid state, the author finds that under compression involving mechanical deformation, compounds which may be regarded as resulting from the combination of a solid with a liquid tend to decompose into these generators. The present series of experiments is confined to the anhydrous and hydrated sulphates of the alkali metals. The compression was effected in a steel cylinder, the bottom of which was perforated with a single small hole to permit liquid to flow away and provided with a loosely-fitting piston between which and the walls of the cylinder the salt could "flow."

Lithium hydrogen sulphate was found to have the sp. gr. 2·123: when compressed there was a visible formation of sulphuric acid, and the composition of that portion of the salt which had "flowed" was approximately represented by the formula $9LiHSO_4,2H_2SO_4$. The monohydrated salt behaved similarly, and the solid residue left in the cylinder in this case contained 10·8 per cent. of lithium as against 5·85 per cent. present in the original monohydrate.

Sodium hydrogen sulphate was found to have the sp. gr. 2·435 at 13° as against 2·742 found by Playfair and Joule. When compressed, no decomposition occurred. The monohydrate had the sp. gr. 2·103 at 13·5°, and under compression at 10° decomposed very slightly if at all, but lost 64·5 per cent. of its water of crystallisation when compressed at 40°. The salt $6NaHSO_4,H_2SO_4,16H_2O$ liberated sulphuric acid and water under compression at 10°, and was almost completely converted into anhydrous sodium hydrogen sulphate. The salt

$$5NaHSO_4,H_2SO_4,7H_2O$$

was converted into $NaHSO_4$ by compression at 40°, and the salt $5NaHSO_4,H_2SO_4,3H_2O$ into $5NaHSO_4,H_2SO_4$ by compression at 16° and into $NaHSO_4$ at 80°, whence it appears that water is eliminated before sulphuric acid under these conditions.

Anhydrous potassium hydrogen sulphate (sp. gr. 2·302 at 13°) and the corresponding salts of caesium (sp. gr. 3·352 at 16°) and rubidium (sp. gr. 2·892 at 16°) underwent no change even when compressed at 100°, but the salt $2KHSO_4,3H_2SO_4,3\frac{1}{2}H_2O$ was converted into

$$KHSO_4,H_2SO_4,H_2O$$

by compression at the ordinary temperature.

When a mixture of sodium hydrogen sulphate with cupric oxide was subjected to simple compression, no combination occurred; but when mechanical deformation accompanied the compression, a mixture of sodium and cupric sulphates was formed. A similar change was to some extent produced by simply grinding the two substances together in a mortar.

It is pointed out that these observations may furnish an explanation of the variations observed in the composition of certain rocks.

T. A. H.

The Equations of Clausius and van der Waals for the Mean Length of Path and Number of Collisions. PHILIPP KOHNSTAMM (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 6, 787—793).—**Van der Waals' Equation of State.** PHILIPP KOHNSTAMM (*ibid.*, 794—807).—Mathematical; unsuitable for abstraction. A. McK.

Crystallisation in Three Component Systems. WILLIAM C. GEER (*J. Physical Chem.*, 1904, 8, 257—287).—The three-component system is studied with the main object of determining the composition of the phases which separate when ternary systems are cooled. The locus of the points representing the composition of the liquid during cooling until the quintuple point is reached, is called the crystallisation curve, and the author shows this is a straight line until a boundary curve is reached which it follows. Of these boundary curves, two types exist: along one, two phases separate together; along the other, one phase separates whilst the second disappears: and both types are discussed. Numerous diagrams are given in the paper to illustrate the course of the curves. The conclusions drawn are illustrated by data taken from various systems which have been previously investigated, namely, the systems copper chloride, potassium chloride and water, potassium sulphate, magnesium sulphate and water, ferric chloride, hydrogen chloride and water; and gold, cadmium, and tin. L. M. J.

The Ternary System: Benzene, Acetic Acid, and Water. AZARIAH T. LINCOLN (*J. Physical Chem.*, 1904, 8, 248—256).—The author has previously shown that the equilibrium of the system benzene, water, and alcohol is in complete accord with the mass law equation. Waddell, however, has found that the system benzene, acetic acid, and water does not yield equilibria in accord with the mass law (Abstr., 1899, ii, 144); the author has therefore repeated Waddell's work, taking the utmost precaution to ensure purity in the reagents and to obtain the exact composition of equilibrium at the definite temperature required. He shows that Waddell's method of always working to the same degree of cloudiness is an inexact one, and that the first trace of opalescence must be taken. His results are in good accord with the mass law, the values being represented by the equation $n\log x + \log y = \log C$, where x and y represent the quantities of benzene and water per 5 c.c. of acetic acid. It is also shown that two sets of equilibria occur according to which non-miscible liquid separates, so that if curves are drawn for $\log x$ against $\log y$, the curve consists of two straight lines. The values of n are proved to be independent of temperature, this being in accord with the theory. L. M. J.

The Beckmann Rearrangement. Velocity of Transformation of Acetophenoneoxime into Acetanilide. CORNELIS A. LOBRY DE BRUYN and C. H. SLUITER (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 6, 773—778).—Additive compounds as intermediate products have occasionally been isolated during a Beckmann rearrangement, those compounds containing a negative group (or the group OK) attached to the nitrogen atom, which group then changes place with the alkyl or aryl group attached to the carbon atom. The hydroxyl group itself does, however, occasionally replace the negative group referred to.

The Beckmann rearrangement has now, for the first time, been subjected to a dynamical investigation, the transformation studied being that of acetophenoneoxime into acetanilide under the influence of sulphuric acid. The amount of acetanilide in a mixture of it with unchanged oxime, may be estimated by hydrolysing it by boiling for a few hours and then distilling off the acetic acid and titrating it. The velocity with which the anilide is formed may accordingly be determined.

The reaction is unimolecular. The transformation velocity increases with the concentration of the acid. The influence of temperature was also examined.

A solution of sulphur trioxide in chloroform does not cause any transformation of the oxime.

The Beckmann rearrangement is an intramolecular change. If the addition of sulphuric acid causes the formation of an intermediate compound, this formation must occur with immeasurably great velocity.

The views advanced by Stieglitz as to the mechanism of the Beckmann rearrangement are adversely criticised. A. McK.

Ferment Action. Leo Liebermann (*Ber.*, 1904, **37**, 1519—1524). —Colloidal solutions of platinum contain "active" oxygen, which may be detected by means of potassium iodide and starch, *p*-phenylenediamine or indigo solution. The action of hydrogen or nitrogen on the solution causes a diminution of the amount of the active oxygen, whilst the exclusion of air or oxygen entirely prevents the solutions responding to the foregoing tests. Hydrogen and nitrogen affect the colloidal solutions in a different way, the former changing the brownish shade of the solution to blackish-brown. In certain circumstances, the foregoing gases may enhance the catalytic activity of the solutions with regard to hydrogen peroxide, probably by increasing the number of the platinum particles. On boiling, the colloidal solutions lose their active oxygen and, at the same time, their power of decomposing hydrogen peroxide, although no separation of platinum occurs; if the solutions are allowed to cool in air or oxygen they gradually regain their activity, but in an atmosphere of hydrogen or nitrogen this recovery is much retarded. The author considers, contrary to Bredig's view (Abstr., 1900, ii, 213), that the first phase in the catalytic decomposition of hydrogen peroxide is the formation of an oxide of platinum by the intervention of atmospheric oxygen, and that the hydrogen peroxide reduces this, forming molecular oxygen, which again combines with platinum.

A number of "catalases" of vegetable and animal origin were found neither to contain "active" oxygen nor to possess the power of rendering oxygen active. On the other hand, most were able to absorb ozone in such a way that its presence in solution could be detected; air, oxygen, hydrogen, and nitrogen did not affect their catalytic activity. The mechanism of the decomposition of hydrogen peroxide by these ferments differs essentially from that caused by colloidal platinum; a direct action on the peroxide must be assumed, which produces an unstable "ferment-oxide" similar to that formed by ozone. W. A. D.

Pseudo-Acids. Jan von Zawidzki (*Ber.*, 1904, **37**, 2298—2301. Compare Kauffmann, this vol., ii, 326).—Basing his argument on the law of mass action, the author shows that the "apparent" dissociation constant (k_e), calculated from the electrical conductivity of a pseudo-acid, must be smaller than the "real" dissociation constant (k_1) unless isomerisation is complete. The constant $k_1 = \frac{k_{H_2O}}{k}$, where k is the constant of hydrolysis of the sodium salt. The isomerisation constant (k_2) of the pseudo-acid is calculated from the equation $k_2 = k_e/(k_1 - k_e)$. G. Y.

Laws of Formation of the Chemical Elements. B. N. Tschitscherin (*J. Russ. Phys. Chem. Soc.*, 1904, **36**, 359—401).—The author develops mathematically the system of the chemical elements, based on experimental data previously developed by him (*J. Russ. Phys. Chem. Soc.*, 1888, 1889, and 1892). T. H. P.

New Method for the Exact Determination of the Molecular Weights of the Permanent Gases; Atomic Weights of Hydrogen, Carbon, and Nitrogen. Philippe A. Guye (*Compt. rend.*, 1904, **138**, 1213—1215).—The author finds that the value of R, calculated from the relation $Vm(1+a)(1-b)=R$ (compare Guye and Friderich, Abstr., 1900, ii, 709; 1902, ii, 599), varies between 22412 and 22420 for the gases hydrogen, nitrogen, oxygen, and carbon monoxide; if, however, the correction mT_c (where $m=0{\cdot}085$) be applied to R, the relation $Vm(1+a)(1-b)=R+mT_c$ can be used to calculate the molecular weights of the permanent gases, for $m=\frac{L}{1000}\frac{R+mT_c}{(1+a)(1-b)}$, where L is the weight in grams of 1 litre of the gas at 0° and under 1 atmosphere pressure. Using the values of L obtained by Morley (as recalculated by Guye and Mallet, this vol., ii, 392) for hydrogen and oxygen, and by Rayleigh for nitrogen and carbon monoxide, the following atomic weights are obtained: $H=1{\cdot}00765$; $O=16{\cdot}00$; $N=14{\cdot}004$; $C=12{\cdot}003$. M. A. W.

Valency and the Periodic System. Attempt to formulate a Theory for Molecular Compounds. Richard Abegg (*Zeit. anorg. Chem.*, 1904, **39**, 330—380).—The distinction between stable compounds which readily suffer dissociation and those which do not, is one of degree. In connection with the relationship between "affinity" and valency, it is pointed out that the affinity of the different valencies of an atom cannot be alike, otherwise such a change as, for example, the conversion of ferric into ferrous chloride could not take place. An attempt is made to formulate a theory for molecular compounds on the basis of varying valency of the elements (compare Abegg, Abstr., 1903, ii, 536). When one valency is satisfied in the case of a polyvalent atom, where initially the valencies were alike, the residual valencies are weakened; the difficulty with which the second hydrogen ion in a dibasic carboxylic acid is split off is analogous. Chemical compounds, where the formation of ions cannot be detected, are held together by something of the nature of electro-affinity. The manner in which traces of ionisation of a compound may be detected is indicated. Certain elements are amphoteric in character; thus, hydrogen, boron, silicon, phosphorus, arsenic, antimony, sulphur, and iodine exhibit either positive or negative electro-affinity, according to the nature of the other elements present. The positive electro-valency is more in evidence with the heavier elements of the one group; as, for example, where the elements in question are regarded as the positive portion of the molecule and are combined with the negative portion: thus, nitrogen forms only a trichloride, whilst the specifically heavier phosphorus forms both a tri- and penta-chloride. Other instances are quoted with reference to the variation of affinity with the size and polarity of the atom. The hypothesis of "normal" and "contra"-valencies is further developed. Chlorine possesses one negative normal valency and seven positive contra-valencies, whilst silver possesses one positive normal valency and seven (hypothetical) contra-valencies. The variation of valency in the different groups is indicated as follows:

Group:	1	2	3	4	5	6	7
Normal valencies ...	+1	+2	+3	±4	−3	−2	−1
Contra-valencies ...	(−7)	(−6)	(−5)	−	+5	+6	+7

Under the heading of molecular compounds the author discusses associated compounds and others such as complex salts and hydrates. The decomposition of a polymeric compound, such as cyanuric acid, at an elevated temperature, indicates that polymeric compounds may also be included under the compounds commonly termed molecular.

The greater the number of contra-valencies possessed by any particular element, the greater the tendency to the formation of molecular compounds in which the element is contained. Solutions may also be included in the same category as molecular compounds. The capability of a metal to appear in the neutral portion of a complex anion or as a single ion of a complex cathion is an expression of its negative contra-valency. A. McK.

Characterisation of Flame. Nicolae Teclu (*J. pr. Chem.*, 1904, [ii], 69, 359—361).—A current of coal-gas is passed into the centre tubulure of a three-necked Woulf's bottle, the two side tubulures of which are fitted with jets so arranged as to allow of variations in the length of the gas columns between the bottle and the flames. It is found that, if the gas pressure be sufficiently diminished, the flames vary in length with their relative heights above the bottle. If the current is stopped, the lower flame is first extinguished, extremely small differences in height causing this. If the openings of the jets are different, the jet with the larger opening must be raised above the other to produce similar flames. G. Y.

A New Mercury Air-Pump. Fritz W. J. Boekhout (*Chem. Zeit.*, 1904, 28, 459—460).—A new mercury air-pump is described. It has the advantage of being less liable to breakage than the Töpler pump.

A. McK.

[Lecture Experiment.] Preparation of an Explosive Mixture of Hydrogen and Oxygen. Nicolae Teclu (*J. pr. Chem.*, 1904, [ii], 69, 362—364).—The author describes an apparatus for mixing hydrogen and oxygen in the proper proportion for an explosive mixture for lecture experiments.

G. Y.

[Lecture Experiment.] Electrolysis of Water. Nicolae Teclu (*J. pr. Chem.*, 1904, [ii], 69, 364—365).—A modification of the usual lecture apparatus for demonstrating the electrolysis of water is figured.

G. Y.

Inorganic Chemistry.

Decomposition of Hydrogen Peroxide under the Influence of Radium Bromide. Henry J. H. Fenton (*Proc. Camb. Phil. Soc.*, 1904, 12, 424—426).—The velocity coefficient for the decomposition of hydrogen peroxide in paraffin-coated vessels, calculated from the expression for a unimolecular reaction, gradually increases as the peroxide concentration diminishes. In glass vessels the decomposition velocity is irregular at first, but becomes approximately constant after a few days. The velocity of decomposition, either in glass or paraffin-coated vessels, is approximately doubled under the influence of radium bromide.

J. C. P.

Boiling Oxygen. A. Bestelmeyer (*Ann. Physik*, 1904, [iv], 14, 87—98).—A study of the extent of possible superheating in boiling oxygen. The results obtained make it probable that previous determinations of the boiling point of oxygen, in which the thermometer was immersed in the liquid, are a few tenths of a degree too high. On the other hand, the author's results are in harmony with the determinations of Travers, Senter, and Jaquerod (Abstr., 1903, ii, 9), who used a statical method.

J. C. P.

The Melting Points of Oxygen and Nitrogen. Tadeusz Estreicher (*Bull. Acad. Sci. Cracow*, 1903, 831—844).—The melting point of oxygen was determined with a helium thermometer; it was found to be approximately $-227°$. The vapour pressures of melting oxygen, nitrogen, and atmospheric nitrogen were determined by solidifying these gases in a closed vessel connected with a mercury manometer. When the solids were allowed to melt slowly, the pressure, at first zero, gradually rose to a value which remained constant until complete liquefaction had taken place. In this way, the vapour pressure of melting oxygen was shown to be 0·9 mm., that of melting nitrogen 93·5 mm., and atmospheric nitrogen 90·2 mm. The vapour pressures of nitrogen at temperatures near the melting point have already been determined (Fischer and Alt, *Münchener Akad.*, 1902, 209); with the aid of Ramsay and Young's method, these values may be used to calculate the temperature of nitrogen corresponding with any vapour pressure. Accordingly, the temperature of nitrogen which exerts a pressure of 93·5 millimetres is found to be −210·24° (this figure represents the melting point of pure nitrogen); similarly, atmospheric nitrogen is shown to melt at −210·47°. The difference between the two values, 0·23°, is the lowering in the freezing point of liquid nitrogen which is exerted by the argon in atmospheric nitrogen (1·70 grams per 100 grams of nitrogen). In this way, the author calculates the molecular depression of freezing point of liquid nitrogen and finds it to be 5·39, whence the latent heat of fusion equals 14·49 cal. or 60·44 Joules. S. S.

Heat of Vaporisation of Oxygen and Sulphur Dioxide. Tadeusz Estreicher (*Bull. Acad. Sci. Cracow*, 1904, 183—196).—The method consists in measuring the volume of gas liberated by a known amount of heat which is generated in a platinum resistance wire immersed in the liquid. The quantity of electricity passing through the resistance during the experiment was determined by means of a silver voltameter, and the difference of potential between the ends of the wire was measured with a standardised voltameter.

In measuring the volume of the gas liberated, a correction must be applied for the normal evaporation which takes place without heating the platinum wire. The sulphur dioxide employed was prepared by dropping concentrated sulphuric acid into a strong solution of sodium sulphite. The heat of vaporisation of liquid sulphur dioxide at its boiling point (10·1°) was found to be 96·2 cal. per gram; a value which agrees very closely with that obtained by Mathias (Abstr., 1888, 773), 96·19 at the same temperature.

The oxygen was prepared from potassium chlorate, and was washed with potassium hydroxide before use. The latent heat of vaporisation of liquid oxygen is 58·0 cal. per gram. S. S.

Ozone Apparatus. W. Elworthy (*Chem. Centr.*, 1904, i, 1313—1314; from *Electrochem. Zeit.*, 11, 1—5).—In the apparatus described, the silent discharge takes place between spirals of aluminium. The air does not require to be cooled by water, the temperature being kept sufficiently low by employing a rapid stream which is made to pass twice through the field of discharge by means of concentric glass tubes. The air is not specially dried. The apparatus comprises a battery of 10 tubes together with other accessories. By employing an alternating current at 130 volts raised to 11,000—12,000 volts by means of a transformer, 70 grams of ozone per kilowatt-hour are obtained, and the concentration of the ozone reaches 0·4—0·5 gram per cubic metre. E. W. W.

Formation of Ozone at High Temperatures. J. K. Clement (*Ann. Physik*, 1904, [iv], 14, 334—353).—Since the stability of endothermic substances increases as the temperature rises, it is to be expected that at high temperatures oxygen is converted, partly at least, into ozone. Attempts to realise this, in which oxygen was rapidly passed over the electrolytic glow body of a Nernst lamp, were unsuccessful, and no ozone could be detected. So long as traces of nitrogen were present in the oxygen, nitric oxide was produced, a substance the behaviour of which in small concentrations is very similar to that of ozone. The formation of ozone at high temperatures has been recorded by earlier workers, but it is probable that the reactions observed were those of nitric oxide, since no care was taken to exclude nitrogen. Ozone is certainly produced by an electric spark, but this result may be attributed to the action of ultraviolet light.

The author has further studied the rate of decomposition of ozone at higher temperatures. A current of ozonised oxygen, obtained by electrolysis of sulphuric acid, was passed through a vessel kept at a constant temperature, the amounts of ozone before and after the passage of the gas being determined by absorption in potassium iodide and subsequent titration with thiosulphate. The reaction is bimolecular, as found also by Warburg (Abstr., 1902, ii, 130), and van't Hoff's equation for the change of velocity coefficient with temperature represents the experimental results very satisfactorily. It may thus be shown that at 1000° the percentage of ozone in oxygen would fall from 1·0 to 0·001 in 0·0007 second. Hence, even if ozone is formed in quantity at a temperature of about 2200°, it must be decomposed during even the most rapid cooling. J. C. P.

Action of Sulphuryl Chloride on Metallic Oxides. E. Spelta (*Gazzetta*, 1904, 34, i, 262—267).—Sulphuryl chloride and lead oxide do not react, even when heated together at 140—150° in a sealed tube for several hours.

With lead peroxide, however, sulphuryl chloride readily reacts, sometimes with explosive violence, according to the following equation: $2PbO_2 + SO_2Cl_2 = PbSO_4 + PbCl_2 + O_2$. If the sulphuryl chloride is in slight excess, and the mixture becomes heated above its boiling point, chlorine is also evolved.

With mercuric oxide prepared in the dry way, sulphuryl chloride does not react even on prolonged heating. With yellow mercuric oxide (2 mols.), however, sulphuryl chloride (1 mol.) readily reacts at 150° in a closed tube: $2HgO + SO_2Cl_2 = HgSO_4 + HgCl_2$. If the sulphuryl chloride is in excess, sulphur trioxide is also formed, according to the equation: $HgO + SO_2Cl_2 = HgCl_2 + SO_3$.

From these reactions it is seen that sulphuryl chloride, which is readily formed from sulphur dioxide and chlorine, is also readily resolved into these components, the change being hence a reversible one. The chlorinating action of sulphuryl chloride must be due to a slightly stable linking between the sulphur dioxide and chlorine, a linking which must have a special form, since its rupture takes place preferably in presence of elements having an electro-positive character. T. H. P.

Electrolytic Oxidation of Sulphites and Electrochemical Formation of Dithionate. Alfred Friessner (*Zeit. Elektrochem.*, 1904, 10, 265—289).—In neutral or alkaline solutions, the sulphites of the alkali metals are not reduced at the cathode; at the anode they are oxidised, partly to sulphate, partly to dithionate, $2Na_2SO_3 + O + H_2O = Na_2S_2O_6 + 2NaOH$. Dithionate is not formed under any conditions when the solution is acid, the only product formed at the anode being sulphate; at the cathode, however, hyposulphite and thiosulphate are produced. The formation of dithionate in neutral or alkaline solutions is found to be conditioned by the potential of the anode. By polarising the (platinum) anode anodically in a solution of sodium hydroxide before use, the formation of dithionate is insured, whereas a cathodically polarised or a depolarised electrode gives no dithionate. These remarks apply to platinised platinum anodes: a smooth platinum anode soon becomes polarised in the sulphite solution itself sufficiently to produce dithionate even if it is initially depolarised. The formation of dithionate is favoured by a rise of temperature to 60—70°; it is practically unaffected by the concentration of the sulphite solution. The latter fact together with the fact that it is not formed in acid solutions shows that the dithionate is produced from SO_3'' ions, and the following equation is given as representing the electrical reaction, $2SO_3'' + 2OH' + 2H^{\bullet} + 2F = S_2O_6'' + 2H_2O$.

A solution of dithionic acid or of one of its salts is not reduced at the cathode, and undergoes very little oxidation at the anode.

T. E.

Reduction of Nitrates by Certain Plant Extracts and Metals, and the Accelerating Effect of Certain Substances on the Progress of the Reduction. Joseph H. Kastle and Elias Elvove (*Amer. Chem. J.*, 1904, 31, 606—641).—A freshly prepared aqueous extract of the potato tuber is capable of effecting the reduction of sodium nitrate to nitrite, but this property is destroyed by boiling. The reduction takes place most rapidly at 40—45°. If the quantity of nitrate is increased, the amount of nitrite produced gradually rises to a maximum beyond which a further addition of nitrate retards the reduction. By increasing the amount of potato extract, the reducing action is increased until a maximum is reached beyond which additional quantities of the extract produce no further effect. The reduction is inhibited by mercuric chloride, chloroform, resorcinol, and alkalis, and is considerably weakened by phenol, phenylhydrazine hydrochloride, sodium hypophosphite, quinol, hydroxylamine hydrochloride, benzenesulphinic acid, sodium fluoride, and hydrogen cyanide. On the other hand, certain substances, especially alcohols and aldehydes, cause a considerable acceleration in the reducing action of the potato extract; for example, in the presence of benzyl alcohol or benzaldehyde, the amount of nitrite produced is increased from 25 to 30 times. The reduction in presence of such accelerators is subject to the same conditions as in their absence, and is affected in the same way by changes of temperature and variation in the quantities of nitrate and potato extract employed. The conversion of nitrate into nitrite by means of potato extract appears to take place most readily in a slightly acid solution but, in presence of an accelerator, acids cause a diminution in the reduction to an extent depending on the quantity and strength of the acid employed.

The aqueous extracts of many other plants were examined, but only the fruit of the egg plant (*Solanum melongena*) and the tubers and sprouts of the potato were found to be capable of effecting the reduction.

The reduction of nitrates by metals was also studied. In the first series of experiments, platinum black was employed, which was prepared by precipitating the metal from its chloride by means of zinc dust, and afterwards washing the precipitate with hydrochloric acid and with water and drying it at the ordinary temperature. The results showed that platinum black prepared in this manner is capable of reducing sodium and potassium nitrates to nitrites, and that the amount of nitrite produced is greatly increased by the presence of such substances as ethyl alcohol, formaldehyde, and formic acid. It was also found that if this platinum black was heated to 100° for half an hour, its activity was slightly increased, whilst if heated to 300° for the same length of time it became much more active. In view of these results, it seemed of interest to study the behaviour of platinum black prepared by other methods, and it was found that none of the specimens so produced possessed the activity of the metal obtained by precipitation with zinc dust, whilst certain of them were totally incapable of effecting the reduction of nitrates. It was discovered that the activity of the first specimen of platinum black was due to the presence of zinc as an impurity.

Pure precipitated silver is quite inactive towards potassium nitrate even in presence of an accelerator, whilst silver-zinc alloy, prepared by immersing zinc in solution of silver nitrate, shows considerable reducing power, especially in the presence of certain other substances, such as formaldehyde. E. G.

Preparation and Properties of Hypophosphorous Acid.

CHARLES MARIE (*Compt. rend.*, 1904, **138**, 1216—1217).—Pure barium hypophosphite, precipitated by alcohol from aqueous solution, dried in the air, dissolved in boiling water, and treated with the theoretical quantity of dilute sulphuric acid, yields a solution of hypophosphorous acid from which the pure acid can be obtained by concentration, first by boiling under the ordinary pressure, and then in a vacuum at 80—90° until there is no further loss in weight. Hypophosphorous acid can also be prepared by treating the dried sodium salt with the theoretical quantity of concentrated sulphuric acid, and after two days extracting the hypophosphorous acid from the sodium sulphate by means of alcohol. Hypophosphorous acid, purified by fractional crystallisation and dried over phosphoric anhydride, melts at 26·5°; its decomposition by heat into orthophosphoric acid and hydrogen phosphide really takes place in two stages: (1) at 130—140°, hydrogen phosphide and phosphorous acid are formed according to the equation $3H_3PO_2 = 2H_3PO_3 + PH_3$; (2) at 160—170°, the phosphorous acid is decomposed into phosphoric acid and hydrogen phosphide. M. A. W.

Apparent Volatilisation of Silicon in Hydrogen. A. Dufour (*Compt. rend.*, 1904, 1169—1170. Compare this vol., ii, 398).—The passage of an electric discharge through a Geissler tube filled with silicon hydride immediately causes a deposit of amorphous silicon; if, however, the current is continued for about an hour, the original deposit of silicon gradually disappears and is reformed in the dark space around the cathode. The final deposit is always formed in the dark space, even if other parts of the tube are cooled to 80°; hence the phenomenon cannot be due to the distillation of the silicon from the hot regions to the colder. The facts can only be explained satisfactorily by supposing the silicon to recombine with the hydrogen present to form silicon hydride, which is decomposed in the dark space by the impact of the corpuscles emitted from the cathode. Arsenic hydride behaves in a similar manner, but in this case the removal of the arsenic can be proved to be due to distillation. S. S.

Synthesis of Silicon Hydride from its Elements. Émile Vigouroux (*Compt. rend.*, 1904, 1168).—The author draws attention to the fact that he had already observed the direct formation of silicon hydride from its elements before the publication of a paper by Dufour on that subject (this vol., ii, 398). S. S.

Further Experiments on the Production of Helium from Radium. Sir William Ramsay and Frederick Soddy (*Proc. Roy. Soc.*, 1904, 73, 346—358).—The earlier research (Abstr., 1903, ii, 622) has been continued, and details are given of the experiments in which the production of helium from radium has been observed. The authors have examined the gas given off from a solution of radium bromide in 60 days, and formed an estimate of the helium produced by comparing the intensity of its spectrum with that of a known quantity of helium at a known pressure. The experiments show that 1 gram of radium bromide should give in one year 0·0022 mg. of helium.

An attempt has been made to measure also the volume of the emanation in a fine capillary tube, and it is estimated that 1 gram of radium produces 3×10^{-6} cub. mm. of emanation per second. The molecule of the emanation is probably monatomic, and since diffusion experiments indicate a density of about 80, its atomic weight should be about 160. Hence, not more than one atom of emanation can be produced from one atom of radium, and the average life of the radium atom is probably about 1100 years. The total quantity of energy evolved in the change of 1 gram of radium is about 250,000 times the energy evolved in the formation of 1 gram of water.

Comparing their value for the equilibrium quantity of emanation produced by 1 gram of radium with Rutherford's calculated value, the authors consider that there are now direct experimental reasons for believing that (1) only one α-particle is expelled from the atom at each disintegration; (2) the greater part of the energy of disintegration appears in the form of kinetic energy of α-radiation. J. C. P.

Bell Process of Electrolysing Aqueous Solutions of Alkali Chlorides. Otto Steiner (*Zeit. Elektrochem.*, 1904, 10, 317—331).—The process studied is a technical method of electrolysing solutions of potassium chloride in which the anode is contained in a non-conducting bell, suspended, mouth downwards, in a solution of the salt, the cathode dipping into the solution outside. In these circumstances, the heavy solution of potassium hydroxide formed at the cathode collects at the bottom of the vessel and diffuses slowly up into the bell, where it meets the faintly acid chlorine solution formed at the anode; a neutral layer is thus formed within the bell and below the anode. By constantly feeding fresh solution of potassium chloride into the bell just above the anode, the neutral layer may be maintained stationary at any desired position between the anode and the open mouth of the bell. The author has made a careful study of the conditions necessary to maintain this neutral zone; he finds that the even distribution of the fresh solution over the whole area of the bell is of great importance. This can be attained by dropping the solution on to a horizontal plate of metal wrapped up in glass wool. The greater the concentration of the potassium chloride and the smaller that of the hydroxide, the greater is the distance between the anode and the neutral zone. So long as this distance exceeds 1 cm., graphite anodes are practically unacted on (up to current densities of 0·02 ampere per sq. cm.). Using a saturated solution of potassium chloride, the current efficiency, under these conditions, is from 85 to 94 per cent. so long as the concentration of the hydroxide is not greater than about 130 grams per litre; 3·7 to 4·2 volts are required. T. E.

Velocity of Decomposition of a Mixture of Sodium Nitrite and Ammonium Chloride. E. Berger (*Bull. Soc. chim.*, 1904, [iii], 31, 662—666. Compare Loew, Abstr., 1891, ii, 16; Angeli and Boeris, Abstr., 1893, ii, 155; Wegscheider, Abstr., 1901, ii, 384; Arndt, Abstr., 1902, ii, 64; and Veley, Trans., 1903, 83, 736).—The author has studied especially the influence of temperature and concentration on the interaction of these two salts in aqueous solution. The decomposition was effected in a Victor Meyer vapour density apparatus, the amount of nitrogen evolved in a selected period of time being used as a measure of the rapidity of the reaction. The results, which are tabulated and illustrated by curves in the original, show that the reaction occurs for all concentrations at temperatures above 0°, that its velocity increases rapidly with rise of temperature, and decreases directly as the concentration diminishes, so long as this does not fall below 50 grams per litre. For more dilute solutions than this, the velocity of reaction diminishes more rapidly, since the salts become largely ionised and so escape the reaction. T. A. H.

Electrolysis of Calcium Chloride. Henri Moissan (*Compt. rend.*, 1904, 138, 1194—1196. Compare this vol., ii, 333).—A reply to Bullier (compare this vol., ii, 403).—The author's experiments differ essentially from those of Bullier in that he uses a mixture of calcium fluoride and chloride, which is liquid at 650°, and readily electrolysed with the formation of a mixture of calcium carbide and calcium, the latter preponderating even in the presence of carbon electrodes; whereas the mixture of calcium chloride and oxide used by Bullier does not fuse even at 740°, and the electrolysis proceeds irregularly. M. A. W.

Behaviour of Typical Hydrous Chlorides when Heated in Hydrogen Chloride. FRANK A. GOOCH and F. M. MCCLENAHAN (*Amer. J. Sci.*, 1904, [iv], 17, 365—376).—An investigation has been made of the influence of hydrogen chloride on the dehydration of the hydrous chlorides of barium, magnesium, and calcium. Two wide glass tubes were heated side by side in a paraffin-bath, each tube being provided with a thermometer. A porcelain boat containing a weighed quantity of the hydrous salt was placed in each tube immediately below the bulb of the thermometer. A current of dry air was passed through one tube and a current of hydrogen chloride through the other. At the close of the experiment, the loss of weight in each case was determined, and the chlorine was estimated in the residue in order to ascertain the proportion of the loss due to water and hydrogen chloride respectively. Tabular statements and diagrams are given which indicate the course of the decomposition of the different salts at various temperatures.

The dehydration of hydrous barium chloride, $BaCl_2,2H_2O$, is not affected by hydrogen chloride below 100°, and at this temperature the change is complete. In the case of magnesium chloride, $MgCl_2,6H_2O$, hydrogen chloride appears to exert no influence on the removal of the first third of the water, which is eliminated at 100°, but retards the dehydration between 100° and 130° and accelerates it at temperatures above 130°. The hydrolytic dissociation of this salt is not very marked below 200° in either air or hydrogen chloride. The dehydration of aluminium chloride, $AlCl_3,6H_2O$, is inhibited by hydrogen chloride below 130°, but above this temperature, as also in air above 100°, both water and hydrogen chloride are evolved simultaneously.

The paper concludes with a discussion of the bearing of these results on the general molecular configuration of hydrous chlorides, and it is shown that a reasonable explanation is afforded by the hypothesis of varying relations in the position of the water in the molecular complex based on the assumption of quadrivalent oxygen as suggested by Cushman (Abstr., 1902, ii, 322). E. G.

Specific Gravities of Lithium Chloride, Bromide, and Iodide. GREGORY P. BAXTER (*Amer. Chem. J.*, 1904, 31, 558—564).—The sp. gr. of carefully purified lithium chloride, bromide, and iodide at 25°/4° have been determined by means of the pycnometer described by Baxter and Hines (this vol., ii, 257), with the following results: fused lithium chloride, 2·068; fused lithium bromide, 3·464; fused lithium iodide, 4·061.

Attention is drawn to a slight error in the calculations which occurred in the recent papers by Baxter and Hines (*loc. cit.*) and Baxter and Lamb (this vol., ii, 257). The corrected values for the sp. gr. are as follows: cadmium chloride, 4·047; cadmium bromide, 5·192; silver bromide, 6·473. The error in the case of zinc chloride is beyond the limit of accuracy of the experiments. E. G.

The Characterisation of Lead: Reply to Clemens Winkler. Karl A. Hofmann (*Ber.*, 1904, 37, 2197—2198).—The author's determination of the equivalent of radioactive lead sulphate (Abstr., 1901, ii, 159) has been objected to by Winckler (this vol., ii, 462) on the ground that the lead sulphate employed was heated only at 400—420°, and may therefore have contained adherent sulphuric acid. Experiments with purified lead nitrate show that excess of sulphuric acid is completely removed from lead sulphate at 355°, and the objection cannot therefore be maintained. C. H. D.

Fractionation of Cerium Earths. Henri Lacombe (*Bull. Soc. chim.*, 1904, [iii], 31, 570—573. Compare Auer von Welsbach, Abstr., 1885, 350, and Demarçay, Abstr., 1900, ii, 347).—The author finds that neodymium and praseodymium can be separated from each other and from samarium, and perhaps also from lanthanum, more rapidly and effectually by fractional crystallisation of the double manganese nitrates of the type $2Di(NO_3)_3,3Mn(NO_3)_2,24H_2O$, than by Demarçay's process. The fractionation is best carried out in nitric acid of sp. gr. 1·3; the volume of the mother liquor should be maintained almost constant, and be very small in comparison with the bulk of crystalline matter separated. The formation of crystals may be initiated by a nucleus of the isomorphous bismuth manganese nitrate. Typical examples of the results of the application of this process to (1) earths rich in neodymium, (2) earths rich in praseodymium, and (3) earths rich in lanthanum, are quoted in the original.

T. A. H.

Salts of the Complex Cerisulphuric Acid with the Elements of the Rare Earths. Bohuslav Brauner (*Zeit. anorg. Chem.*, 1904, 39, 261—295. Compare Brauner and Picek, this vol., ii, 259; Meyer and Aufrecht, this vol., ii, 175).—An historical survey of researches on cerium sulphates is first given. The author quotes further results with cerium sulphates and describes salts formed from ceric sulphate and lanthanum, praseodymium, and neodymium respectively.

A mixture of yellow ceric sulphate, $Ce(SO_4)_2,4H_2O$, and red cerosoceric hydrogen sulphate, $Ce_2H(SO_4)_4,12H_2O$, is formed by the action of water and concentrated sulphuric acid on ceric tetroxide. Crystallographic measurements of both salts are given. Cerosoceric hydrogen sulphate is also formed synthetically from cerous sulphate and ceric sulphate; the latter must be in excess, and the solution must also contain enough free sulphuric acid to maintain the ceric sulphuric acid in solution. When a mixture of cerous and ceric sulphates in solution is allowed to crystallise in presence of sulphuric acid, just sufficient in amount to prevent the hydrolysis of the ceric salt, an orange-brown compound with the composition

$$[Ce^{IV}(SO_4)_4]_3Ce_4^{III},44H_2O$$

separates. Generally, however, mixtures of normal and acid salts are obtained, the amount of the latter formed depending on the amount of free sulphuric acid present.

In the red cerosoceric salt, the tervalent cerium atom may be replaced by other tervalent atoms. With lanthanum, for example, two salts are obtained. When a solution containing lanthanum sulphate, cerium sulphate, and sulphuric acid just sufficient to prevent the hydrolysis of the ceric salt is allowed to crystallise, the orange-yellow salt of the composition $[Ce^{IV}(SO_4)_4]_3La_4^{III},44H_2O$ separates. On the other hand, when the mixture contains an excess both of ceric sulphate and sulphuric acid, the salt $Ce^{IV}(SO_4)_4La^{III}H,12H_2O$ separates. The salts $Ce(SO_4)_4PrH,12H_2O$ and $Ce(SO_4)_4NdH,12H_2O$ were formed in an analogous manner.

Cerosoceric hydrogen sulphate and the salts formed by the replacement of the tervalent cerium in it by lanthanum, praseodymium, and neodymium respectively separate in hexagonal crystals; they are isomorphous and form mixed crystals. A. McK.

Preparation of Samarium Oxide and the Atomic Weight of Samarium. GEORGES URBAIN and HENRI LACOMBE (*Compt. rend.*, 1904, 1166—1168. Compare Abstr., 1904, ii, 37, 173, 340).—Samarium oxide was prepared by a method which has been described in a previous communication. The purity of the product is proved by the fact that the atomic weight of the metal does not vary greatly in material obtained from different sources. The atomic weight of samarium was determined in three ways: by the conversion of (1) the hydrated sulphate, $Sa_2(SO_4),8H_2O$, into the anhydrous salt, $Sa_2(SO_4)_3$; (2) of the anhydrous sulphate into the oxide, Sa_2O_3; (3) of the hydrated sulphate into the oxide. The mean of three experiments with each of these methods gave 153·340, 150·346, and 150·346 respectively ($O = 16$). The atomic weight may therefore be taken as 150·34. S. S.

Action of Certain Solutions on Aluminium and Zinc. WATSON SMITH (*J. Soc. Chem. Ind.*, 1904, 23, 475—477).—The action of solutions of phosphoric acid, sulphuric acid, acetic acid, nitric acid, ammonia, sodium carbonate, ammonium phosphate, ammonium arsenate, sodium chlorate, sodium nitrate, and potassium nitrate on aluminium and zinc respectively has been examined, as also has been the action of cold and hot water on these metals. A. McK.

Aluminium-Tin Alloys. E. S. SHEPHERD (*J. Physical Chem.*, 1904, 8, 233—247).—Although various workers have investigated these alloys, their results left in doubt the existence of definite compounds, such as AlSn and Al_4Sn, whilst other points recorded required confirmation. The author therefore determined the freezing points of alloys of from 10 to 50 per cent. aluminium, taking many precautions to ensure accuracy; the greatest difference obtained for the freezing point of any alloy is only 4 degrees. The curve obtained is perfectly continuous and does not indicate the existence of any definite compound. Previous observers had found either a minimum at about 20 per cent. aluminium or a constant temperature between about 17 and 25 per cent., but neither of these observations was confirmed. The flatness of the curve might be expected to indicate an unstable region of two liquid layers below the freezing point curve, but experiments showed that this does not exist. The densities of various alloys were determined and the values and curves are given. Photographs are also given of the etched surface of different alloys. These help to confirm the author's view that the tin exists in the form of a solid solution up to the concentration of about 20 per cent.

L. M. J.

A Property of Tin-Aluminium Alloys. Hector Pécheux (*Compt. rend.*, 1904, 1170—1171).—Electrolytic gas is evolved if a recently filed rod of tin-aluminium alloy is immersed in cold distilled water. The evolution of gas may be prolonged by increasing the filing of the metal. The phenomenon seems to be due to the juxtaposition of the molecules of each metal. The specific heats of aluminium and tin are widely different, hence after the action of the file the molecules of each metal will be at different temperatures and a series of thermo-electric couples will be established when the alloy is immersed in water.

S. S.

Constitution of Ultramarine. Paul Rohland (*Zeit. angew. Chem.*, 1904, **17**, 609—616).—Mainly historical. Ultramarine, when mixed with Portland cement, undergoes hydration and combines with the free calcium hydroxide in the cement. It also undergoes hydration in the absence of Portland cement, and the rate of this hydration is influenced by positive catalysers, such as aluminium chloride and sodium carbonate. Sodium chloride in dilute solution acts as a positive catalyser in the case of ultramarine, whilst it has no action under the same conditions with Portland cement; in more concentrated solution, it acts as a retarder with Portland cement. The hydration of ultramarine is a feebly exothermic reaction. The hydration and hardening of ultramarine are doubtless aided by the formation from it by heat of a dilute solid solution of sodium oxide with the silicious constituents.

A. McK.

Indium. Carl Renz (*Ber.*, 1904, **37**, 2110—2112).—Dennis and Geer's recent method for the purification of indium by means of tripyridine indium chloride (this vol., ii, 342) had been previously described by the author (Abstr., 1903, i, 774; ii, 548 and 729).

Indium oxide, when heated to a white heat in an iridium dish, sublimes without previously melting. The greyish-white powder formed on cooling contains abundant glistening crystals. Two modifications of indium oxide are to be distinguished—a yellow, amorphous form, soluble in acids, and a crystalline form insoluble in acids. Metallic indium combines with selenium and tellurium, forming black masses with a metallic lustre.

E. F. A.

Soluble Colloidal Form of Ferric and of Other Phosphates. William J. Sell (*Proc. Camb. Phil. Soc.*, 1904, **12**, 388—390).—In presence of ammonia, diammonium hydrogen phosphate dissolves a considerable quantity of ferric phosphate to a brownish-red solution. If the solution is dialysed until all electrolytes are removed, it may be shown to contain ferric phosphate, which is slightly basic, owing to a little ferric hydroxide. The colloidal solution of ferric phosphate is tasteless and without action on litmus. Addition of alkali chlorides and most other salts induces gelatinisation. The very small value of the conductivity points to there being no free iron ions in the solution, and this is confirmed by the failure of potassium thiocyanate and ferrocyanide to give any colour reaction; these reagents cause gelatinisation only. On the other hand, hydrogen sulphide and ammonium sulphide both give black precipitates.

Aluminium and chromium phosphates also give colloidal solutions, which, although weaker, behave similarly to that of ferric phosphate.

J. C. P.

Preparation of Nickel Carbonyl and Metallic Nickel. Sir James Dewar (D.R.-P. 149959).—The formation of nickel carbonyl from nickel and carbon monoxide, which takes place at 50° under the ordinary pressure, may be advantageously carried out under a pressure of 2—100 atmospheres, in which case the temperature may be raised even to 250° without causing decomposition. The reaction is in this way greatly accelerated. Moreover, the condensation of the nickel carbonyl is best performed under pressure, so that the excess of carbon monoxide may be led back over the nickel under the same pressure. A suitable apparatus is described and figured. C. H. D.

Action of Alkali Nitrites on Nickel Salts. I. C. Reichard (*Chem. Zeit.*, 1904, 28, 479—480).—Double nickel nitrites with the alkaline earth metals are capable of being formed even in the absence of the hydroxides of these metals. When barium nitrate is added to a mixture of nickel nitrate and potassium nitrite, the double salt is gradually precipitated; there is no precipitation, however, when acetic acid has first been added to the nickel nitrate and potassium nitrite. Strontium nitrate has the same effect as barium nitrate. Calcium nickel potassium nitrite was prepared. The action of magnesium, zinc, and cadmium salts towards nickel salts in the presence of alkaline nitrites was also studied. Sodium nitrite was also substituted for potassium nitrite in the formation of nickel double nitrites. A. McK.

Amount of Chlorine which can be Precipitated by Silver Salts from the Green Hydrate of Chromium Chloride or Bromide. Rudolf F. Weinland and A. Koch (*Zeit. anorg. Chem.*, 1904, 39, 296—329. Compare Werner and Gubser, Abstr., 1901, ii, 453; Wyrouboff, Abstr., 1902, ii, 565).—The authors have examined the behaviour of the hydrate of chromium chloride, $CrCl_3,6H_2O$, towards silver salts, and find that the amount of chlorine precipitated depends on the nature and the quantity of the particular silver salt used and especially on the nature and the quantity of the particular acid added. Of the silver salts examined, all, without the addition of acids, precipitate at least two-thirds of the chlorine, some of them precipitate more, and some precipitate the chlorine entirely. When the precipitations were conducted in alcoholic solutions, all the chlorine was precipitated without the addition of acid; when nitric acid was added, the amount of the chlorine precipitated diminished. With the green hydrate of chromium bromide, the various silver salts examined precipitated the bromine entirely without the addition of acid; by the addition of certain acids, however, the amount of the precipitated bromine could be diminished to two-thirds of the total. The silver salts of weak acids, such as acetic, lactic, and nitrous acids, and silver sulphate precipitate the chlorine completely from solutions of the hydrate of chromium chloride, whilst the silver salts of strong acids do not. Many figures are quoted to show the percentage of chlorine precipitated under such different conditions as by silver nitrate and nitric acid, silver sulphate and sulphuric acid, silver chlorate and chloric acid, silver perchlorate and perchloric acid, silver permanganate and permanganic acid, silver lactate and lactic acid, silver acetate and acetic acid.

Solutions of the double chloride, $CrCl_3,2CsCl,4H_2O$, were also studied. A. McK.

Preparation of Crystallised Zirconium in the Electric Furnace. Edgar Wedekind (*Zeit. Elecktrochem.*, 1904, 10, 331—335).—Potassium zirconium fluoride is fused with excess of aluminium in an electric arc furnace. The product is extracted with hydrochloric acid and potassium hydroxide solution in order to remove excess of aluminium. Crystalline plates, having the appearance of antimony, are left, which contain about 34 per cent. of aluminium, corresponding nearly with the formula $ZrAl_2$. The substance is dissolved by hydrofluoric acid or by fused alkalis; no other usual substance acts on it with the exception of hot aqua regia, which dissolves it slowly. It only undergoes superficial oxidation when heated in a blowpipe flame. It conducts electricity, and may be fused by compressing it in a quartz tube and passing a current of electricity through it (using platinum terminals). The fused substance contains less aluminium than the original material, its composition being approximately Zr_3Al_4. The substance $ZrAl_2$ apparently crystallises in the regular system, and the author considers it to be a real compound and not an alloy.

An experiment in which magnesium was used to reduce potassium zirconium fluoride gave a product from which all the magnesium could be removed, leaving a substance containing 94·1 per cent. of zirconium. It may be possible in this way to obtain pure crystalline zirconium.

Electrolysis of the fused double salt gave only amorphous zirconium.

T. E.

Decomposition of Antimony Hydride. Alfred Stock and Oskar Guttmann (*Ber.*, 1904, 37, 1957—1960. Compare this vol., ii, 413).—A reply to Bodenstein (this vol., ii, 246). W. A. D.

The Melting Point of Gold. Daniel Berthelot (*Compt. rend.*, 1904, 1153—1155).—The most accurate determinations of the melting point of gold have been made by the author (Abstr., 1898, ii, 341), by Jacquerod and Perrot (*Compt. rend.*, 1904, 138, 864), and by Holborn and Day (Abstr., 1901, ii, 85). The numbers obtained by these investigators are corrected, when they become 1065·6° (Berthelot), 1067·4° (Jacquerod and Perrot), and 1064·3° (Holborn and Day).

S. S.

Solubility of Gold in Certain Oxidising Agents. Victor Lenher (*J. Amer. Chem. Soc.*, 1904, 26, 550—554).—Gold is dissolved by a solution of crystalline telluric acid in sulphuric or phosphoric acid. Since, during the solution of gold either by telluric or selenic acid, the acids are converted into dioxides and oxygen is evolved, it appeared probable to the author that the solvent action in those cases is due to the production of oxygen in the reaction. The substances employed by the author were halogen-free; only those substances which give oxygen in presence of acids act on gold. A mixture of manganese dioxide and concentrated sulphuric acid readily dissolves gold when heated with it for a few minutes. Solution also takes place slowly at low temperatures. The higher oxides of manganese behave in a similar manner. Gold is also dissolved when heated with solid potassium permanganate and sulphuric acid (or phosphoric acid). Lead dioxide, lead sesquioxide, and red lead, when heated with sulphuric acid, also dissolve gold; with the higher oxides of lead, phosphoric acid may be substituted for sulphuric acid. Chromium trioxide, chromium tetroxide, and nickelic oxide behave similarly. Gold is soluble when heated with a mixture of nitric and sulphuric acids. The action of oxygen gas on gold leaf suspended in hot sulphuric acid was also tried, but neither oxygen nor ozone caused any of the metal to dissolve. When oxygen is formed at the anode during electrolysis of sulphuric acid, gold is dissolved quickly when the acid is concentrated; when the acid is dilute, the anode is coated with an incrustation of the oxide. Similar results were obtained when phosphoric acid is substituted for sulphuric acid, or when the hydrogen sulphates of potassium or sodium are employed. In the case of an alkaline electrolyte, some of the gold passes through the solution, probably from the formation of an alkali aurate; with neutral salt solutions, very little, if any, of the gold passes through the electrolyte, the anode being converted into the oxide, Au_2O_3. In these electrolytic experiments, the current used was 0·3—0·5 ampere at a pressure of 5 volts, the anode being a sheet of gold and the cathode a platinum crucible.

A. McK.

Ruthenium. V. Ruthenium Chlorides. James L. Howe (*J. Amer. Chem. Soc.*, 1904, 26, 543—549. Compare Abstr., 1902, ii, 86).—*Potassium aquochlororuthenate*, $K_2Ru(OH_2)Cl_5$, prepared by boiling a slightly acidified (with hydrochloric acid) solution of potassium chlororuthenite with alcohol, or by boiling a solution of the hydrated sesquioxide in hydrochloric acid with alcohol, crystallises in orthorhombic octahedra; on boiling, its solution becomes greenish-brown; its characteristic reaction is the immediate darkening of its solution on addition of bromine or chlorine water. The salt is stable up to 140°; between 140° and 180°, it loses water, passing into potassium chlororuthenite, K_2RuCl_5.

Aquochlororuthenates of the type $X_2Ru(OH_2)Cl_5$ are isomeric with chlororuthenites, which are thus represented: X_2RuCl_5,H_2O. Crystals of the dehydrated potassium aquochlororuthenate preserve the form of the aquo-salt; their solution differs from that of potassium chlororuthenite. Aqueous solutions of the chlororuthenite and the aquochlororuthenate undergo a similar decomposition in water, accompanied by an increase in the conductivity, but the increase is much slower in the case of the aquo-salt. Whilst the initial value for the conductivity is the same for the two salts, the final value for the aquo-salt is much less than that for the chlororuthenite.

Ammonium aquochlororuthenate, $(NH_4)_2Ru(OH_2)Cl_5$, prepared by boiling ammonium chlororuthenite with dilute acidified alcohol, crystallises with difficulty; when chlorine is passed into its concentrated aqueous solution, *ammonium chlororuthenate*, $(NH_4)_2RuCl_6$, is produced. *Potassium chlororuthenate*, K_2RuCl_6, prepared by the action of chlorine on a concentrated acid solution of potassium aquochlororuthenate, forms minute, black octahedra, easily soluble in, and rapidly decomposed by, boiling water to form a pale purplish-brown solution. *Cæsium chlororuthenate*, Cs_2RuCl_6, is prepared in an analogous manner. A. McK.

Mineralogical Chemistry.

Artificial Production of Crystallised Domeykite, &c. George A. Koenig (*Proc. Amer. Phil. Soc.*, 1903, 42, 219—237; *Zeit. Kryst. Min.*, 1904, 38, 529—554).—A glass tube containing arsenic at one end and metallic copper (filings, turnings, or wire) in the middle was heated to dull redness (about 600°) by means of an electric current passing through a platinum wire wound around the tube. As the arsenic sublimes over the heated copper, brilliant crystals of copper arsenide, Cu_3As (domeykite), are seen to grow out from the surface of the copper, the growth taking place in such a manner as to suggest that there must be a free movement of the copper molecules.

Using, in place of copper, an alloy of copper, nickel, and cobalt, crystals of $(Cu,Ni,Co)_3As$ (mohawkite, Abstr., 1901, ii, 109) were obtained; with an alloy of copper and silver, crystals of $(Cu,Ag)_3As$ (argento-domeykite) and of $(Cu,Ag)_6As$ (argento-algodonite); and with an alloy of copper and antimony, crystals of $Cu_3(As,Sb)$ (stibio-domeykite; Abstr., 1901, ii, 109). When arsenic vapours are passed over zinc, lead, or nickel, there is also some action, but no crystals were formed.

A crystallographic description by Fred. Eugene Wright is given of the artificial crystals of domeykite, argento-domeykite, and mohawkite, all of which are holohedral hexagonal. Artificial crystals of domeykite have previously been described as orthorhombic (Abstr., 1903, ii, 301). L. J. S.

Artificial Production of Brushite and Monetite. August B. de Schulten (*Bull. Soc. franç. Min.*, 1903, 26, 11—17).—Crystals of brushite ($HCaPO_4,2H_2O$) suitable for goniometric measurement were obtained by dissolving precipitated hydrogen calcium phosphate in acetic acid (25 per cent.) and allowing the solution to slowly evaporate at the ordinary temperature. At temperatures above 50°, the solution deposits crystals of monetite ($HCaPO_4$). Attempts to produce metabrushite ($HCaPO_4,1\frac{1}{2}H_2O$) were without success, and reasons are given for considering this to be identical with brushite. Crystallographic descriptions are given. L. J. S.

Artificial Production of Newberyite. August B. de Schulten (*Bull. Soc. franç. Min.*, 1903, **26**, 24—29).—Crystals of the salt $HMgPO_4,7H_2O$ are obtained by allowing a solution of phosphoric acid to act on magnesium carbonate, and when these remain for some time in contact with the liquid they are converted into crystals of newberyite ($HMgPO_4,3H_2O$). Debray's salt, $HMgPO_4,4\frac{1}{2}H_2O$, consists of a mixture of these. Crystals of newberyite, suitable for goniometric measurement and of varying habits, were obtained by the following methods: heating a solution of magnesium carbonate in phosphoric acid in a sealed tube at 150°; evaporating on the water-bath an acetic acid solution of hydrogen magnesium phosphate; and by the method employed for the production of crystallised monetite (Abstr., 1902, ii, 89). L. J. S.

Artificial Production of Pharmacolite and Haidingerite. August B. de Schulten (*Bull. Soc. franç. Min.*, 1903, **26**, 18—24).—Crystals of pharmacolite ($HCaAsO_4,2H_2O$) are deposited from a clear solution containing calcium chloride, hydrochloric acid, and hydrogen sodium arsenate. From more concentrated solutions, crystals of both pharmacolite and haidingerite ($HCaAsO_4,H_2O$) are deposited. Measurable crystals of haidingerite were obtained by the method previously employed for preparing crystallised monetite (Abstr., 1902, ii, 89). L. J. S.

Formation of Oceanic Salt Deposits. XXXVI. Combinations of Minerals from 25° to 83°. Jacobus H. van't Hoff and Wilhelm Meyerhoffer (*Sitzungsber. K. Akad. Wiss. Berlin,* 1904, 659—670).—A general review of all previous results. So far as the changes in the mutually possible combinations are concerned, the above temperature range may be divided into three intervals. The first interval, 25—37°, is marked by the disappearance of schoenite, reichardtite, and magnesium sulphate hexahydrate. The second interval, 37—55°, covers the appearance of langbeinite, loeweite, vanthoffite; whilst in the third interval, 55—83°, blödite, leonite, and kainite successively disappear from the equilibrium diagrams.

The various changes and transformations that take place in presence of sodium chloride between 25° and 83° are fully given in the following summary:

I. Changes involving the splitting off of water.
    A. Transformation of schoenite into leonite.
        (1) In presence of glaserite and potassium chloride (25·5°).
        (2) In presence of glaserite and blödite (26°).

B. Transformation of reichardtite into magnesium sulphate hexahydrate.

(1) In presence of leonite and kainite (27°).

(2) In presence of leonite and blödite (27·5°).

(3) In presence of blödite (31°).

C. Transformation of hexahydrate into kieserite.

(1) In presence of leonite and kainite (31·5°).

(2) In presence of leonite and blödite (32°).

(3) In presence of blödite (35·5°).

D. Transformation of blödite into loeweite.

(1) In presence of langbeinite and kieserite (43°).

(2) In presence of langbeinite and leonite (47°).

(3) In presence of kieserite (49°).

(4) In presence of glaserite and leonite (56·5°).

(5) In presence of glaserite and vanthoffite (59·5°).

(6) In presence of vanthoffite (60°).

II. Changes involving the formation of double salts.

A. Transformation of leonite and kieserite into langbeinite.

(1) In presence of kainite (37°).

(2) In presence of blödite (37·5°).

B. Transformation of blödite and thenardite into vanthoffite.

(1) In presence of glaserite (46°).

(2) Alone (48·5°).

C. Transformation of leonite into glaserite and langbeinite.

(1) In presence of potassium chloride (60·5°).

(2) In presence of loeweite (61·5°).

D. Transformation of kainite into kieserite and potassium chloride.

(1) In presence of carnallite (72°).

(2) In presence of langbeinite (83°).

III. Transformation at 55° of leonite and kainite into langbeinite and potassium chloride.

For the purpose of applying these results, the following table will be found useful. It shows the temperature limits within which the combination indicated may occur. A + sign means that the combination is possible over the whole range, 25—83°; a – sign or blank means that the combination is not possible within that temperature interval.

	Langb.	Vanth.	$MgSO_4$6aq.	Carn.	Leon.	Glas.	
Then. ...	—	above 46°	—	—	—	+	Then.
$MgSO_4$7aq.	—	—	up to 31°	—	up to 28°	—	$MgSO_4$7aq.
Schön...	—	—	—	—	up to 26	up to 26°	Schön.
Loew. ..	above 43°	above 60	—	—	47—62	above 57	Loew.
Blöd. ...	38—47	46—60	28—36	—	up to 57	up to 60	Blöd.
Kies. ...	above 37	—	up to 36	+	32—38	—	Kies.
Kain. ...	37—83	—	up to 32	up to 72°	up to 55	—	Kain.
KCl ...	above 55	—	—	+	up to 61	+	KCl
Glas. ...	above 61	about 46	—	—	26—62	Glas.	
Leon. ...	37—62	—	27—32	—	Leon.		
	Langb.	Vanth.	$MgSO_4$6aq.	Carn.			

	KCl.	Kain.	Kies.	Blöd.	
Then. ...	—	—	—	up to 49°	Then.
$MgSO_4 7aq.$	—	up to 27°	—	up to 31	$MgSO_4 7 aq.$
Schön...	up to 26°	—	—	up to 26	Schön.
Loew. ..	—	—	above 43°	43–60	Loew.
Blöd. ...	—	—	32—49	Blöd.	
Kies. ...	above 72	up to 83	Kies.		
Kain. ..	up to 83	Kain.			
	KCl.				

J. C. P.

Barytes from dep. Lozère. Guédras (*Compt. rend.*, 1904, **138**, 1440).—The occurrence of veins of barytes at Altier (with ores of copper and tin) and at Villefort (with lead ore) is noted. L. J. S.

Soretite, a new Variety of Amphibole. Louis Duparc and Francis Pearce (*Bull. Soc. franç. Min.*, 1903, **26**, 126—135).—This variety of amphibole forms, with anorthite and accessory apatite and magnetite, veins of anorthite-diorite (anal. I) in the dunite and koswite of the Koswinsky Kamen in the northern Urals. Its reference to a new variety is based on the optical characters [$\alpha = 1{\cdot}6856$, $\beta = 1{\cdot}6765$, $\gamma = 1{\cdot}6628$; $2V = 82°30'$; optically negative; extinction on (010), 17°; pleochroism, α dark green, β green, γ pale greenish-yellow], which vary slightly in different specimens, and on the chemical composition (anal. II); sp. gr. 3·223:

	SiO_2.	TiO_2.	Al_2O_3.	Cr_2O_3.	Fe_2O_3.	FeO.	MnO.
I.	40·30	—	17·63	0·34	6·35	10·28	trace
II.	4·52	1·71	10·99	—	9·64	9·83	trace

	CaO.	MgO.	Na_2O.	K_2O.	Loss on ignition.	Total.
I.	13·85	8·23	2·48	0·26	0·92	100·64
II.	12·33	11·82	2·38	0·68	0·50	100·40

L. J. S.

Meteoric Irons of Ranchito [Bacubirito] and Casas Grandes. Emil W. Cohen (*Mitth. naturw. Ver. Neu-Vorpommern u. Rügen*, 1904, **35** (1903), 3—13).—Ranchito, near Bacubirito, Sinaloa, Mexico (compare Abstr., 1902, ii, 669).—This consists mainly of fine grained plessite; the structure is octahedral with very fine lamellæ. Sp. gr. 7·589; analysis gave the results under I.

Casas Grandes, El Paso del Norte, Chihuahua, Mexico (compare Abstr., 1902, ii, 670).—This is an octahedrite with lamellæ of medium width, and is rich in tænite. Sp. gr. 7·885; analysis II.

	Fe.	Ni.	Co.	Cu.	Cr.	C.	P.	S.	Cl.	Chromite.	Total.
I.	89·54	9·40	0·98	0·02	0·02	0·01	0·12	0·02	0·02	0·01	100·14
II.	92·66	7·26	0·94	—	0·03	—	0·18	0·02	—	0·03	101·12

L. J. S.

Physiological Chemistry.

The Palæochemistry of the Ocean in Relation to Animal and Vegetable Protoplasm. Archibald B. Macallum (*Trans. Canadian Institute*, 1903—1904).—The composition of the ocean represents the result of (1) the action of water on the land in past ages, and (2) the chemical and other agencies modifying the power of sea water to retain mineral constituents in solution. In river water, the calcium is always more, and the potassium less abundant than sodium, whilst the magnesium approximates to the latter in amount, In the sea, the sodium is much more abundant than the other three elements. This is due to fixation of the calcium in limestone deposits, to the fixation of potassium in animal and vegetable organisms, and subsequently in glauconite and other potassium-holding deposits. The magnesium added by river water exceeds that removed from the sea, and in consequence is increasing in the ocean, although not so rapidly as the sodium. In the early geological periods, the proportions of these elements must have been different from what they are now, and must have approximated to the proportion now found in river water. It is assumed that this early condition lasted until the appearance of life, and the earliest unicellular organisms acquired a fixed relation of the given elements during what was doubtless a long period. When, later, land organisms appeared and soils were formed, the removal of potassium to the sea was diminished. This, combined with the fixation of potassium and of calcium in the sea already mentioned, has kept these elements fairly constant since that remote period. But in the transition stage, unicellular organisms became multicellular, and developed circulatory systems, the fluid in which was at first modified sea water. In the blood-plasma of vertebrates, sodium, potassium, and calcium are relatively strikingly like those which now obtain in sea water; the magnesium only is present in smaller proportion. This is due to heredity and reproduces the conditions of sea water at the date when a circulatory system first appeared. If it were possible to determine the proportion of the four elements in protoplasm, apart from that in inert and adventitious structures formed by living cells, it is surmised that their proportion would be that of sea water before the development of the circulation. W. D. H.

Effects of Breathing Rarefied Air. J. Tissot (*Compt. rend.*, 1904, 138, 1454—1456).—The effect on man of breathing air containing 11 per cent. of oxygen, that is, equivalent to air at an altitude of 5000 metres, as measured by the respiratory exchange, is negligible.

W. D. H.

The Eggs of Acanthias vulgaris. Emil Zdarek (*Zeit. physiol. Chem.*, 1904, 41, 524—529).—These eggs contain 47 per cent. of dry material, containing inorganic substances, especially phosphates, and probably free metaphosphoric acid. Protamine is absent; fat and cholesterol are present; the fat includes phosphorised fat. The main constituent is proteid, of which elementary analyses are given: on decomposition, the principal substance obtained is leucine; glycine is also found, and small quantities of arginine and lysine. W. D. H.

Albumin of Fishes' Eggs, compared with that in the Sperm in the Same Species. LOUIS HUGOUNENQ (*Compt. rend.*, 1904, 138, 1062—1064).—Herring's eggs contain 6·5 lecithin, 10·3 fat, 2·3 keratin, and 81·5 proteid per cent. The latter presents the chief characters of vitellin: analysis gave C,53·68; H,7·38; N,14·64; S,0·40; O, 23·90 per cent. On decomposition, it yields leucine, tyrosine, other amino-acids, and hexone bases. In containing a proteid of this character, the egg contrasts with the sperm, in which the principal proteid matter is nucleo-proteid and protamine. W. D. H.

Albumin of Frog's Eggs. J. GALIMARD (*Compt. rend.*, 1904, 138, 1354—1355).—The proteid obtained from frog's eggs is termed *ranovin.* It gives the usual proteid reactions and appears to be allied to vitellin. In its percentage of nitrogen and the proportion of amino-acids obtained from it, it differs somewhat from Hugounenq's clupeovin obtained from herring's eggs (Compare preceding abstract).
W. D. H.

Diffusible Alkali and Alkali-tension of the Blood in Disease. KURT BRANDENBURG (*Chem. Centr.*, 1904, i, 1369—1370; from *Zeit. klin. Med.*, 45, 157—199).—Numerous numerical data on the alkalinity of the blood in various conditions. It has but little influence in the molecular concentration of the blood. W. D. H.

Blood Coagulation. LEO LOEB (*Chem. Centr.*, 1904, i, 1281—1282; from *Virchow's Archiv*, 176, 10—47. Compare Abstr., 1904, ii, 353).—Agglutination and fibrin formation are two separate phenomena. Heating the blood of the guinea-pig to 50° does not influence the former, but prevents the latter. The action of tissues in accelerating the coagulation of blood-plasma, is regarded as specific, and not due to lymph. Numerous bacteria, especially *Staphylococcus pyogenes aureus*, hasten clotting. W. D. H.

Agglutination and Hæmolysis by Chemical Precipitates. O. GENGOU (*Compt. rend.*, 1904, 138, 926—928).—A preliminary notice showing that certain precipitates, such as calcium fluoride and barium sulphate, agglutinate and hæmolyse the red corpuscles of rabbit, ox, and fowl. They absorb fibrin ferment, and in certain cases fibrinogen also. W. D. H.

Agglutination of Red Corpuscles by Colloidal Ferric Hydroxide, Sodium Chloride, and Different Serums. MADAME GIRARD-MANGIN and VICTOR HENRI (*Compt. rend.*, 1904, 138, 1461—1463).—Red corpuscles of dog, horse, and rabbit, obtained by centrifugalising, and suspended in an isotonic solution of salt or sugar, are agglutinated by a small amount of colloidal ferric hydroxide; the addition of serum, even after being heated at 60°, prevents this, but a serum

which itself causes agglutination is not made more active by ferric hydroxide. Differences in detail are noted between different animals, and also between the corpuscles when in sugar or salt solutions. Starch prevents agglutination by ferric hydroxide, by normal serum, and by excess of sodium chloride, but not that produced by a specific serum.
W. D. H.

Influence of the Stromata and Liquid of Laked Corpuscles on the Production of Hæmolysins and Agglutinins. George N. Stewart (*Amer. J. Physiol.*, 1904, **11**, 250—281).—The stromata and hæmoglobin-containing fluid of coloured corpuscles, laked by various agents, when injected into animals of another species, causes the production of specific hæmolysins and agglutinins. In general, the hæmolytic effect is most marked after the injection of the stromata, and the hæmolytic effect after the injection of the liquid. But the results do not warrant the conclusion that in the intact corpuscle the substance which causes the production of agglutinin is all in the stroma, and the substance which produces the hæmolysin is all in the cellular contents.

Corpuscles fully fixed by formaldehyde cause on injection the production of specific agglutinins, and to a smaller extent of specific hæmolysins; they are also capable of being agglutinated by specific sera.
W. D. H.

Influence of Hæmorrhage on Metabolism. Philip B. Hawk and William J. Gies (*Amer. J. Physiol.*, 1904, **11**, 171—236. Compare this vol., ii, 184).—A full account of experiments, a preliminary notice of which has already appeared.
W. D. H.

Velocity of Pepsin Secretion in the Dog. Reginald O. Herzog (*Zeit. physiol. Chem.*, 1904, **41**, 425—436).—A mathematical formula relating to the velocity of pepsin secretion is given, which holds for feeding both on meat and bread. In milk feeding, the secretion is more rapid, and the intense stimulation of the mucous membrane may be there due to the fluidity of the food. If the meat is prevented from reaching the stomach by a previous œsophagotomy, irregular figures are obtained, the rapidity of secretion being then probably influenced by nervous stimuli.
W. D. H.

Digestibility of Connective Tissue Mucoids in Pepsin-Hydrochloric Acid. E. R. Posner and William J. Gies (*Amer. J. Physiol.*, 1904, **11**, 330—350).—The mucoids of connective tissue are digestible, although very slowly, in pepsin-hydrochloric acid. A considerable amount (at least 10 per cent.) of undigested residue is always left. The soluble products (muco-albuminate, muco-proteoses, mucopeptones) resemble ordinary peptic products. The indigestible matter consists of resistant compounds of proteid and glucothionic acid; the mucoproteoses contain also a good deal of glucothionic acid, although whether this is an accidental admixture is not settled. The glucothionic acid is similar to chondroitin-sulphuric acid. The peptones do not contain it. The mucoids of connective tissue are readily digested by trypsin in alkaline solution. Leucine, tyrosine, and tryptophan are produced from them in abundance.
W. D. H.

Proteid in Nutriment for Human Beings. Henri Labbé and Morchoisne (*Compt. rend.*, 1904, 138, 1365—1367).—In an experiment performed on one of the authors for 38 days, the amount of nitrogen in the food was decreased to as little as 2 or 3 grams daily. The subject of the experiment is stated to have remained in perfect health, but the figures given show a slight diminution of body-weight, and on the days when least proteid was taken, an output of nitrogen greater than the intake. W. D. H.

Proteid Synthesis in the Animal Body. Otto Loewi (*Zeit. Biol.*, 1904, 46, 110—112). Ernst J. Lesser (*ibid.*, 113—117).—Polemical. The first-named author believes in proteid synthesis from the products of proteolysis, and criticises the results of the second author, who does not. The second paper is a reply to the first. W. D. H.

Quantitative Analysis of Brain and Spinal Cord. Waldemar Koch (*Amer. J. Physiol.*, 1904, 11, 303—329).—The present paper relates mainly to methods of analysis. The following table gives the principal results so far obtained :

	White matter of corpus callosum.	Cortex of prefrontal region.	Grey matter free from white.
Proteids	10·0	27·7	21·7
Nucleo-proteids	11·5	16·6	9·6
Neuro-keratin	8·4	2·2	
Extractives	4·7	8·8	5·9
Lecithins	16·2	17·4	7·7
Kephalin and myelin	10·9	4·1	
Phrenosin and kerasin	14·3	8·6	
Cholesterol	15·2	3·9	
Sulphur compound	4·4	8·1	5·4

The above numbers are percentages of solids. The total solids in corpus callosum are 32, and in cortex 18 per cent. W. D. H.

Chemical Researches on the Thyroid and Parathyroids. Jean Chenu and Albert Morel (*Compt. rend.*, 1904, 138, 1004—1007).—The parathyroids in the dog contain only about a quarter the amount of iodine found in the thyroid. The *rôle* of the two organs is different, that of the thyroid being mainly exercised by the iodothyrin it produces. W. D. H.

Nucleo-proteid from the Pancreas. Phoebus A. Levene and Lyman B. Stookey (*Zeit. physiol. Chem.*, 1904, 41, 404—406. Compare Abstr., 1903, ii, 438 ; Bang, Abstr., 1901, i, 299 ; Jones and Whipple, *ibid.*, 1902, i, 731).—A mixture of thymin and uracil has been isolated from the pancreatic nucleo-proteid, and it is thus probable that the proteid is a derivative of a complex nucleic acid, and not merely of guanylic acid, since this does not yield pyrimidine bases on hydrolysis. J. J. S.

Extensibility of Muscle. Motonosuke Goto (*Zeit. Biol.*, 1904, **46**, 38—60).—The form of the extensibility curve of frog's muscles, especially after work, is independent of its excitability. The mechanical properties of muscle are influenced by substances which do not penetrate into the fibres. Extensibility depends on the muscular protoplasm, and also on the external structures (sarcolemma, perimysium). Internal friction and extensibility are two properties of muscle which alter independently of each other. Internal friction is influenced not only by the behaviour of the protoplasm, but also by the condition of the surface. It is necessary to distinguish between internal friction of the muscle-lymph, friction of connective tissue structures on one another, and friction between sarcolemma and protoplasm.

W. D. H.

The Amount of Iodine in Animal Cells. J. Justus (*Chem. Centr.*, 1904, i, 1281; from *Virchow's Archiv*, **176**, 1—10. Compare Abstr., 1903, ii, 311).—The following numbers give the amount of iodine in various animal tissues in hundredths of a milligram per 100 grams of tissue or organ: (1) from the calf: thyroid, 105·3; horny substance, 100; thymus, 46·8; skin with hair, 42·9; testis, 39·8; lymph glands, 33·3; liver, 22; mammary gland, 22; spleen, 15; lung, 15; kidney, 10; brain, 6·4; yellow marrow, 0. (2) From man: thyroid, 976; liver, 121; kidney, 105; stomach, 98·9; skin, 87·9; nails, 80; prostate, 68·9; suprarenal, 63·6; lymph glands, 60; spleen, 56; testis, 50; pancreas, 43·1; uterus, 41·3; lung, 32; tendon, 20; small intestine, 11·9; adipose tissue, traces.

The high amount in horny tissues is regarded as noteworthy.

W. D. H.

Alcohol in Animal Organs. Georg Landsberg (*Zeit. physiol. Chem.*, 1904, **41**, 505—523).—Small quantities of alcohol are obtainable from many organs and tissues which are freshly removed from animals. The proportion in which it occurs varies from 1 in 11,000 to 1 in 33,000 parts. The source of the alcohol is uncertain. Unless bacterial action occurs, it is not increased by digesting with sugar.

W. D. H.

Catalase in Different Animal Tissues. F. Battelli and Mdlle. L. Stern (*Compt. rend.*, 1904, **138**, 923—924).—The power of tissues to decompose hydrogen peroxide is attributed by Loew to an enzyme catalase. This reaction may be studied quantitatively by estimation of the amount of oxygen liberated. In the present research, numbers are given for the liver, kidney, heart, muscles, &c., of a frog and guinea-pig; the latter animal gives the higher figures throughout. The liver contains by far the most catalase, and the brain the least; the amount of oxygen disengaged in the first five minutes by the liver was 295 (frog), 305 (guinea-pig); by the brain, 1·2 and 1·6 c.c. in the two animals respectively (0·1 gram of each organ was employed). Active metabolism does not necessarily imply much catalase; thus the figures given for the muscles are not much higher than those for the brain.

W. D. H.

Lævulose in Amniotic Fluid. AUGUST GÜRBER and D. GRÜNBAUM (*Chem. Centr.*, 1904, 1365; from *Münch. med. Woch.*, 51, No. 9).—The sugar in the amniotic fluid of the cow, goat, and pig is lævulose; it is especially abundant in the pig; in the allantoic fluid, it is also present, but here it is least abundant in the pig. In the human fluids, no sugar is present. W. D. H.

The Membrane of Milk Globules. W. VÖLTZ (*Pflüger's Archiv*, 1904, 102, 373—414).—A review of previous work on the so-called haptogen membrane of milk globules, and a number of new experiments and analyses are given. The conclusion is drawn that such a membrane really exists, but its thickness and composition vary in different animals, and also in different stages of lactation in the same animal. They are regarded as very "labile." They consist of variable amounts of proteid, non-nitrogenous organic substances, and ash.
W. D. H.

Formation of Lactose in the Cow. CH. PORCHER (*Compt. rend.*, 1904, 138, 924—926. Compare this vol., ii, 424).—Further observations in reference to milk formation and glycosuria which confirm the hypothesis that lactose originates from the sugar brought to the mammary gland by the blood. W. D. H.

Injection of Phloridzin in the Lactating Cow. CH. PORCHER (*Compt. rend.*, 1904, 138, 1457—1459).—The action of phloridzin on the mammary secretion is an indirect one; the smaller quantity of milk secreted contains a smaller total of lactose than before, although owing to concentration of the milk, its percentage is increased; this is a consequence of renal trouble that leads to diuresis and hypoglycæmia. W. D. H.

Physiology of Glands. IV. LEON ASHER (*Zeit. Biol.*, 1904, 46, 61—76).—A critical discussion on researches on diuresis; it is largely polemical against O. Loewi and against the filtration theory.
W. D. H.

Indoxyl Pigments. LOUIS C. MAILLARD (*Zeit. physiol. Chem.*, 1904, 41, 437—454. Compare Abstr., 1902, i, 371; 1904, ii, 303).—Polemical. A reply to Ellinger and Bouma. W. D. H.

Free Amino-acids in the Blood in Acute Atrophy of the Liver. CARL NEUBERG and P. F. RICHTER (*Chem. Centr.*, 1904, i, 1282—1283; from *Deutsch. med. Woch.*, 30, 499—501).—In a case of acute atrophy of the liver, 0·79 grams of tyrosine, 1·1 of leucine, and 0·24 of lysine were obtained from 345 c.c. of blood; this corresponds with 30 grams of free amino-acids in the whole blood. This was not due to proteolysis in the blood, for no proteolytic enzyme was discoverable there. It may be due to absorption from the intestine, or the breaking down of muscle proteid; another factor is lessened excretion, for the kidneys are comparatively inactive. The tyrosine separated spontaneously when the blood was kept. W. D. H.

Albumosuria. GUSTAVE PATEIN and CH. MICHEL (*Compt. rend.*, 1904, 138, 1363—1365).—The Bence-Jones albumin, as it was formerly called, is regarded not as an albumose, but an albumin. W. D. H.

Autolysis of Animal Organs. ALBERT CHARRIN (*Compt. rend.*, 1904, 138, 1064—1067).—In various morbid conditions, the animal tissues lose much of their useful components, including enzymes, and waste materials are increased. W. D. H.

Pharmacological Action of Iodates, Bromates, Chlorates, other Oxidising Substances, and some Organic Drugs. ALBERT P. MATHEWS (*Amer. J. Physiol.*, 1904, 11, 236—249).—A discussion of the action of several compounds from the ionic point of view. W. D. H.

Intravenous Injection of Adrenaline (Epinephrine) and Peptone. WALTER W. HAMBURGER (*Amer. J. Physiol.*, 1904, 11, 282—302).—If the two substances are injected together, the rise of arterial pressure, due to adrenaline, occurs first, then the fall due to peptone. This takes place in whatever proportions the two are mixed. Peptone immediately following adrenaline does not affect the rise of pressure, but if the order is reversed, the fall due to peptone is checked, and a rise of pressure is seen.

The active "depressor" substance in pituitary extracts is soluble in alcohol, glycerol, and salt solutions, but not in ether. Repeated doses of the alcoholic extract produce always the same effect, but a second dose of the saline extract is ineffective unless a considerable interval elapses. The rise of pressure which follows the fall may be due to a "pressor" substance, or to the elimination of the "inhibitory" substance present in the saline extract. From experiments on the eye, the conclusion is drawn that adrenaline acts on muscular tissue and peptone on vaso-motor nerves. W. D. H.

Toxicity of Amylene Chlorohydrin (Stovaine). L. LAUNOY and F. BILLON (*Compt. rend.*, 1904, 138, 1360—1363).—This anæsthetic, in comparison with cocaine, is from a half to a third as toxic. It differs from cocaine by producing lowering of body temperature and vasodilatation at the point of injection. W. D. H.

Physiological Behaviour of some Camphor Derivatives. JULIUS W. BRÜHL [with RUDOLF KOBERT and RUDOLF GOTTLIEB] (*Ber.*, 1904, 37, 2178—2183).—Hydroxymethylenecamphor possesses weak bactericidal properties, but has none of the physiological action of camphor. Hydroxyethylidene- and hydroxypropylidene-camphors, on the other hand, exhibit the toxic properties of camphor.

α-Iodocamphor is feebly antiseptic, and irritates the mucous membrane. $\alpha\alpha$-Di-iodocamphor is strongly irritant. C. H. D.

Properties of Solutions of Chloroform in Water, Saline, Serum, and Hæmoglobin. BENJAMIN MOORE and HERBERT E. ROAF (*Proc. Roy. Soc.*, 1904, 73, 382—412).—The action of the numerous substances used as anæsthetics probably depends on a general type of interaction between it and the cell protoplasm. The present paper, however, relates to chloroform. Attention should not be restricted to the action of an anæsthetic on nervous structures; all cells (bacteria, amœbæ, ciliated cells, &c.) are equally affected. The action must therefore take place with some chemical constituent present in all varieties of protoplasm, and theories based on the high content of nerve cells in lecithin and fatty constituents may be disregarded. Proteid is the substance of all others universally present in all cells, and it is found that chloroform forms loose compounds with many proteids; if in excess, it will precipitate them. This explains the greater solubility of chloroform in the blood, or serum or hæmoglobin solutions, than in water or in saline solutions. Apparatus is described for determining such solubilities, and the results are given in tabular form. The loose compound of proteid-chloroform is compared to oxyhæmoglobin. When anæsthesia occurs, the proteid-chloroform compound of the blood has parted with its chloroform to the cell-proteids. The compound there formed undergoes dissociation when the chloroform pressure is reduced on cessation of administering the anæsthetic, and anæsthesia thus ceases. W. D. H.

Physiological Action of Radium Emanations. CHARLES BOUCHARD, PIERRE CURIE, and V. BALTHAZARD (*Compt. rend.*, 1904, 138, 1384—1387).—Mice and guinea-pigs confined in a vessel charged with radium emanations died in a few hours, respiration being earliest affected. Means were taken to remove the carbon dioxide formed, and to keep the oxygen supply constant. Death is not due to the ozone produced. *Rigor mortis* sets in early; there is congestion found in kidneys, liver, and brain, but especially in the lungs; the number of leucocytes is lessened. The tissues, especially of the body surface, are radioactive. W. D. H.

Purification of Ricin and of Diphtheria-antitoxin. LUDWIG BRIEGER (*Chem. Centr.*, 1904, i, 1286; from *Festschr. zum* 60 *Geburtstage R. Kochs*, 1903, 364—381).—Two poisonous substances have been isolated from ricin by fractional precipitation with magnesium sulphate. The one which is precipitated contains albumin, whilst the other, which remains in solution, does not. Two samples of ricin were employed, of which one was Merck's and the other a preparation which had been obtained by extracting *Ricinus* seeds with potassium hydrogen carbonate and precipitating with ammonium sulphate. The latter had been kept 10 years, but had not lost any of its poisonous character. A dose of the precipitated substance of 0·1 mg. per kilogram of body-weight, when administered to rabbits, caused death in 24—48 hours, whilst a dose of the second substance of 1 mg. per kilogram of body-weight was fatal only after 4 days. Both substances cause agglutination of the red corpuscles of the blood; the insoluble substance resembles ricin in this respect, but the soluble substance is less effective. Attempts to purify ricin by means of papayotin and to cause the decomposition of the albuminous substance by bacteria both failed.

Experiments on the purification of diphtheria-antitoxin by Pröscher's method (German Patent 13757, June 21st, 1902) did not yield products free from albumin, the antitoxin being liable to putrefaction.
E. W. W.

Chemistry of Vegetable Physiology and Agriculture.

Action of Radium on Micro-organisms. Alan B. Green (*Proc. Roy. Soc.*, 1904, 73, 375—381).—Numerous varieties of bacteria were exposed to the action of radium emanations; the extraneous micro-organisms in vaccine lymph were killed more rapidly than the specific vaccine virus. Non-spore-bearing bacteria exhibit least resistance. Increase of distance from the radium and interposition of screens of mica, glass, lead, and copper gauze weaken the action. After exposure at a distance of 1 mm. to the radium emanations for 24—120 hours, the micro-organisms show signs of radioactivity, and photographs are given which show their effect on a sensitised plate. This lasts for 3 months after exposure. The photographs appear to be caused by β-rays emitted by the organisms. W. D. H.

Reduction produced by Microbes. Martinus W. Beyerinck (*Arch. Néerland*, 1904, [ii], 9, 131—157).—The reduction of tellurates is best observed by employing the potassium salt. The group *Coli* and the vibrios are among the most active in this respect, whilst yeasts and mosses have no reducing action on tellurates. Various yeasts and *Oidium lactis* reduce molybdic acid.

Ferric organic salts are more suitable than ferrous salts for showing the production of sulphites and sulphides by aërobic microbes.

The production of hydrogen sulphide from sulphur, sulphites, and thiosulphates is readily effected by *Microspira desulfuricans* and *M. æstuarii*, as well as by many other microbes, both aërobic and anaërobic, especially by the group *Coli* and vibrios. An anaërobic bacterium (probably a *Thiobacillus*) was observed which produces hydrogen sulphide from sulphites and oxidises it to sulphur with slight aëration; it requires organic carbon.

Canal water contains two bacteria capable of reducing carbon dioxide. The one, *Thiobacillus thioparus*, obtains the necessary energy by the oxidation of hydrogen sulphide to sulphur; the other, *T. denitrificans*, by reducing nitrates to nitrogen. N. H. J. M.

Decomposition of Tellurium Salts by the Action of Micro-organisms. B. Gosio (*Atti R. Accad. Lincei*, 1904, 13, i, 422—427).—Like arsenic compounds, those of tellurium are decomposed by moulds. Whilst, however, all arsenical compounds are attacked, but only by comparatively few species of hyphomycetes, of tellurium compounds, on the other hand, only certain undergo decomposition, but this is carried out, with various degrees of readiness, by all the hyphomycetes examined. The action in the case of the tellurium compounds is much more rapid than with arsenic compounds, and, under favourable conditions, becomes apparent after two or three minutes.

A large number of bacteria were examined, and, in all but a few doubtful cases, decomposition of potassium tellurite took place.

From the author's experiments, it appears probable that the decomposition of tellurium compounds by micro-organisms is not brought about by means of products formed by the organisms, but is a direct consequence of the life or development of the moulds or bacteria.

T. H. P.

Production and Decomposition of Glycogen by Lower Vegetable Organisms. BERTHOLD HEINZE (*Centr. Bakt. Par.*, 1904, ii, 12, 43—78).—In addition to the known glycogen producing organisms, the author has found an alga, probably *Chlorella protothecoides*, and from dairy drainage a variety of *Prototheca* (probably Krüger's *Prototheca Beijerinckii*); also two soil organisms, provisionally termed Dematium-yeast and Dematium-mould. Provisional experiments with some leguminous bacteria (from *Vicia sativa*, *Vicia faba*, *Phaseolus vulgaris*, and *Pisum sativum*) indicated that considerable amounts of glycogen are formed in bacteroid-structures (compare Hiltner, *Arb. biol. Abt. K. Gesundheitamtes*, 3, 151—307).

As regards the production of glycogen by yeast in presence of suitable carbohydrates, pectin substances, and higher alcohols, it was found that conditions of temperature and aëration have a great influence, and that aspartic acid, ammonium carbonate, and lactic acid are favourable. The same conditions are also favourable to its production by the azotobacter-organisms.

N. H. J. M.

Histological and Chemical Changes in Flax Stems under the Influence of Microbes of Pectin- and Cellulose-fermentation. V. OMELIANSKI (*Centr. Bakt. Par.*, 1904, ii, 12, 33—43).—Flax stems subjected to the action of pectin-fermentation (flax rust) and cellulose-fermentation lost in weight 5·6 and 22·3 per cent. respectively. It was found that under the influence of pectin-fermentation all the pectin substances were destroyed, whilst the cellulose remained unchanged. In the case of cellulose-fermentation, most of the cellulose was destroyed, but not all, owing to the products having an injurious action on the fermentation process. The amount of xylan remained about the same in both cases.

N. H. J. M.

Ammonium Thiocyanate and Thiocarbamide as Sources of Nitrogen to Fungi and Micro-organisms. JOSEPH H. KASTLE and ELIAS ELVOVE (*Amer. Chem. J.*, 1904, 31, 550—557).—A nutritive solution containing ammonium thiocyanate as the nitrogenous food material is able to support the growth of *Penicillium glaucum*, whilst a similar solution in which the ammonium thiocyanate is replaced by thiocarbamide is unable to do so. It is found that the thiocarbamide is not poisonous to the fungus, but that its nitrogen is not available for its growth. Potassium thiocyanate is also unable to supply the nitrogen required by the plant, and hence, in the case of ammonium thiocyanate, it is only the nitrogen of the ammonium radicle which is available for food.

Similar results were obtained with the various micro-organisms of putrid cheese and also with yeast. Thiocarbamide, although unable to furnish the nitrogen required for the growth and reproduction of the yeast, does not prevent alcoholic fermentation.

Ammonium thiocyanate slowly undergoes nitrification by the organisms of the soil, whilst thiocarbamide is either acted on extremely slowly or not at all. In this connection, it has been found that when thiocarbamide is treated with hydrogen peroxide, no nitrite is produced even in the presence of both calcium carbonate and manganous chloride, whilst ammonium thiocyanate yields an appreciable quantity of nitrite under these conditions.

E. G.

Leguminous Root-nodules. Lorenz Hiltner and Richard Störmer (*Bied. Centr.*, 1904, 33, 310—322; from *Arb. Biol. Abt. Land. u. Forstwirt.-K. Ges.-Amt.*, 1903, 3, 151 and 302).—In experiments in which the effect of inoculation with pure cultivations has been compared with soil, the results have shown that pure cultures are equal to, and generally better than, soil. Inoculation with soil is only suitable in the case of peat-land and with seeds which germinate rapidly. Seed inoculation may completely fail if the soil is at all dry, owing to the secretion of substances from the germinating seeds which check or destroy the infecting action of the bacteria. This is much more liable to occur with large seeds (lupins and peas, &c.) than with small seeds. The safest method is to let the seeds swell (not under water) before infecting. Even this method is, however, far from satisfactory. Better results were obtained, without previous swelling or germinating, by inoculating the seeds with bacteria in solutions of peptone or dextrose, or in milk. In this manner, the injurious effect of the substances secreted by the seeds is overcome. N. H. J. M.

Influence of Metals on Fermenting Liquids. Leopold Nathan (*Centr. Bakt. Par.*, 1904, ii, 12, 93—94).—Apple must was less affected by metals than beer worts, although it dissolved more of the metal. German silver, copper, zinc, brass, bronze, and black iron were the most active in checking fermentation; then tin and lead. Polished iron, silver, nickel, gold, polished tin, and aluminium were indifferent or only slightly poisonous. N. H. J. M.

Heat of Decomposition in Alcoholic Fermentation. Max Rubner (*Arch. Hygiene*, 1904, 49, 355—418. Compare Abstr., 1901, ii, 304).—The heat of fermentation of sucrose was found to be 150·8 cal. (mean of six experiments with pure cultures). Pure maltose dissolved in beer worts and sown with 10 per cent. yeast gave 148·5 cal. as the heat of fermentation at 38°.

The results of eleven varying experiments with sucrose and maltose, with pure cultures and with growing yeast gave a mean of 149·5 cal., the extreme results being 2·47 above and − 2·81 below the average. Differences in temperature (22—38°) had very little effect, but the amount of by-products may vary according to the rate of the fermentation.

The heat of inversion of sucrose was found to be 9·639 cal. per gram. or 3·293 Cal. per mol., which agrees with Stohman's calculation (+ 3·1 per mol.).

Leaving the inversion out of account, the results calculated for dextrose and for carbon dioxide (gas) are as follows: Dubrunfaut, 21·8; Brown, 21·4; Bouffard, 23·7; and Rubner, 25·6 Cal. The differences, although not inconsiderable, are less than those in results based on thermo-chemical measurements. N. H. J. M.

Velocity of Enzymatic Action. Reginald O. Herzog (*Zeit. physiol. Chem.*, 1904, 41, 416—424. Compare Abstr., 1904, ii, 164). —Further details concerning the mathematical relationships of enzymatic action and the influence on these of rapidity of diffusion are given. W. D. H.

Evolution of Free Nitrogen during Germination. Nicola Castoro (*Landw. Versuchs-Stat.*, 1904, 60, 41—62).—The results of experiments with *Phaseolus multiflorus*, *Pisum sativum*, *Lens esculenta*, *Zea Mais*, *Helianthus annuus*, *Tropæolum majus* showed, in accordance with the earlier experiments of Lawes, Gilbert and Pugh, and Boussingault, that no appreciable evolution of free nitrogen took place during germination. Losses of nitrogen observed in isolated cases must be attributed to decomposition by bacteria. N. H. J. M.

Nitrogen Compounds in Non-germinated Seeds. Ernst Schulze and Nicola Castoro (*Zeit. physiol. Chem.*, 1904, 41, 455—473).—Small amounts of arginine have been extracted from the non-germinated seeds of *Lupinus luteus*, *Lupinus albus*, *Helianthus annuus*, *Triticum vulgare* (embryo), and *Arachis hypogaea* by Kossel and Kutscher's method. The conclusion is drawn that the arginine exists as such in the seeds and is not formed from more complex proteids during the extraction and subsequent treatment.

Tyrosine and asparagine could not be detected in the seeds of *Lupinus luteus*, but vernin (Abstr., 1886, 157) was isolated. This appears to be a glucoside, since, when hydrolysed with dilute sulphuric acid, it yields guanine and a sugar which reduces Fehling's solution, probably a pentose. When vernin is dissolved in sulphuric acid and mixed with α-naphthol, a red colour changing to violet is developed. Red colorations are also produced with phloroglucinol or resorcinol and hydrochloric acid.

Choline and betaine have also been isolated from seeds of *Helianthus annuus*, and choline, vernin, and tyrosine from *Arachis hypogaea*. J. J. S.

Inorganic Phosphates in Plant Seeds and in Seedlings. Ernst Schulze and Nicola Castoro (*Zeit. physiol. Chem.*, 1904, 41, 477—484).—The seeds of the following plants have been tested for inorganic phosphates: *Lupinus angustifolius, Lens esculenta, Vicia Faba, Zea Mais, Picea excelsa, Pinus Laricio, P. Strobus, P. Cembra.* The method employed was as follows: the dried and finely divided seed was left for 2 hours in contact with 10 times its weight of 1 per cent. hydrochloric acid, the phosphates in the clear solution were precipitated by the addition of calcium chloride and ammonia solutions. The precipitate was extracted with ammonium citrate and the solution treated with magnesia mixture. In the case of *Pinus Strobus* only was a precipitate obtained and even here the amount was almost negligible. These results confirm those of Hart and Andrews (this vol., ii, 201).

Etiolated seedlings of *Lens esculenta, Vicia Faba,* and *Zea Mais,* when examined by the same method, were found to contain appreciable amounts of inorganic phosphates. J. J. S.

Intramolecular Respiration of Plants. Emil Godlewski (*Bul. Acad. Sci. Cracow,* 1904, 116—158).—Lupin seeds in pure water develop only a very slight intramolecular respiration when oxygen is excluded, but respiration acquires some vigour when some sugar fermentable by lupin seeds is added. The intramolecular respiration induced in this manner facilitates the hydrolisation of the reserve carbohydrates.

It is possible for lupin seeds to germinate in absence of oxygen when fructose is present, and less readily in presence of sucrose. The roots die after attaining a length of 3—6 mm.

During the intramolecular respiration of lupin seeds in sugar solutions, about 30 per cent. of the proteids are decomposed, the chief product being amino-acids. Asparagine is formed only in small quantities. This result accords with Palladin's observations with young wheat plants, and indicates, in connection with Schulze's theory, that, in absence of oxygen, a synthetical production of asparagine as commencement of proteid regeneration is impossible in the case of higher plants.

The decomposition of proteids in absence of oxygen is of interest as it seems to exhibit dissimilation apart from synthetical processes.

N. H. J. M.

Ready-formed Sugars of Malt. Arthur R. Ling and Theodore Rendle (*J. Inst. Brewing,* 1904, 10, 238—261).—The soluble carbohydrates of malt include sucrose, invert sugar, maltose (?), pentoses, and gummy substances. They are formed chiefly during flooring, but a considerable amount of metabolism goes on during withering and the earlier stages of kilning.

The determination of the soluble carbohydrates of malt, based on digesting the ground malt with water at the ordinary temperature, gives high results, on account of the production of maltose by the action of the diastase on the starch granules during the extraction. This diastatic action may be avoided by extracting the malt with a solution containing 0·02 per cent. of potassium hydroxide or an equivalent amount of sodium hydroxide or ammonia. In this alkaline solution, the total soluble organic matter may be determined directly, whilst the reducing sugars may be determined directly, and the sucrose indirectly, by the cupric reduction method. In the absence of precise knowledge concerning the nature of the reducing sugars, their amount may be expressed as invert sugar. Other circumstances being the same, the percentage of soluble carbohydrates is higher in a forced malt than in one not forced, but even when the amount of these carbohydrates is calculated on the dry malt, it is as yet impossible to fix a definite limiting value for non-forced malts. In pronounced cases of forcing, the sucrose and apparent invert sugar may constitute over 12 per cent. of a malt. The amount of soluble carbohydrates in a malt is reduced by respiration, both aërobic and anaërobic. Pneumatic malt appears to contain less soluble carbohydrates, other than sucrose and invert sugar, than floor malts. The amount of soluble carbohydrates probably varies with the kind and condition of the barley.

T. H. P.

Formation of Oxalic Acid in Green Plants. WILHELM BENECKE (*Bied. Centr.*, 1904, **33**, 387—389; from *Bot. Zeit.*, 1903, 79, and *Naturw. Rundschau*, 1903, **18**, 540).—Oxalate is produced in maize plants grown with nitrate, but not when an ammonium salt is employed as the source of nitrogen. In the case of other plants (*Oplismenus*, *Fagopyrum*, and *Tradescantia*), complete freedom from calcium oxalate could not be attained, but the amount stored up in the plants depended largely on the character of the nutritive solution, being increased by nitrates and diminished by ammonium salts. This is due to the nitrate leaving a basic, and the ammonium salt an acid, residue, and by addition of magnesium carbonate, for example, to the solution containing an ammonium salt, the amount of oxalate in the plants is made to approach nearly, or quite, that accumulated under the influence of a nitrate. Algæ are not similarly influenced.

N. H. J. M.

The Saponifying Power of the Castor Oil Bean. MAURICE NICLOUX (*Compt. rend.*, 1904, 1175—1177).—It is well known that the bean of the castor oil plant is capable of saponifying fats and oils in the presence of free acid. Hitherto this action has been ascribed to the presence of a ferment; it is now shown, however, to be due to the cytoplasm of the bean.

S. S.

Occurrence of Aliphatic Alicyclic Compounds in Plants. HERMANN KUNZ KRAUSE (*J. pr. Chem.*, 1904, [ii], **69**, 385—386).—See this vol., i, 587.

Composition of some Papilionaceæ at Different Stages of Growth. W. G. SÖDERBAUM (*Bied. Centr.*, 1904, **33**, 322—326; from *Meddel. kong. landtbr. akad. exper.*, No. 70, 1—20, *Stockholm*, 1903).—Analyses of *Astragalus glycyphyllus*, *Lathyrus pratensis*, *Medicago sativa*, *Melitolus alba*, *Orobus niger*, *Trifolium pannonicum*, and *Vicia dumetorum* were made at four dates, June 7 and 21, July 5, and August 15. The total nitrogen diminished, but with decreasing rapidity, during the two months. The amide-nitrogen, as percentage of total nitrogen, diminished throughout the whole period in two cases (*Medicago* and *Vicia*), whilst in three cases there was a rise from the second to third period. The digestible proteids in the dry matter showed in some cases an uninterrupted fall, and in others a rise from the third to the fourth period.

The whole series of results shows that the amounts of the different constituents undergo very rapid changes, influencing the nutritive value of the various plants, and that the different plants of the same family vary considerably in this respect. N. H. J. M.

Nature of the Principal Phosphorus Compound in Wheat Bran. A. J. PATTEN and EDWIN B. HART (*Amer. Chem. J.*, 1904, 31, 564—572).—When wheat bran is extracted with 0·2 per cent. hydrochloric acid and the filtered solution is treated with 95 per cent. alcohol, a voluminous, flocculent precipitate is obtained which, when dried at 110°, forms a white, amorphous powder, readily soluble in water. The aqueous solution of this substance is acid to litmus, and on addition of solutions of metallic salts, the compound is reprecipitated. This compound is the magnesium calcium potassium *salt* of an acid, $C_2H_8P_2O_9$, which is probably identical with the anhydro-oxymethylenediphosphoric acid described by Posternak (Abstr., 1903, ii, 680). Its alkali salts are freely soluble in water, the calcium and copper salts are slightly so, whilst the barium and strontium salts are but sparingly soluble. The acid and its salts appear to be widely distributed in the vegetable kingdom. E. G.

Influence of Lime and Marl on the Yield of Vetches. RICHARD ULBRICHT (*Landw. Versuchs-Stat.*, 1904, 60, 135—146).—Notwithstanding the small amounts of calcium and magnesium in the soil, the application of phosphoric acid, potassium, and very little nitrogen resulted in the highest yield. Burnt marble (= 500 kilos. CaO per morgen) somewhat increased the yield, whilst twice that amount caused a considerable reduction in the yield. Magnesite, in conjunction with lime (= 250 kilos. CaO), did not reduce the yield as compared with the same amount of lime alone, but when applied in conjunction with a larger quantity of lime (= 500 kilos. CaO) it had a distinctly injurious effect, the injury increasing with the amount of magnesite.

Heavy applications of burnt dolomite were found to be injurious, but had less effect than the corresponding amounts of lime and magnesia in a mixture of burnt marble and magnesite.

N. H. J. M.

Icelandic Fodder Plants. ST. STEFÁNSEN and W. G. SÖDERBAUM (*Bied. Centr.*, 1904, 33, 394—397; from *Meddel. kongl. landtbruks. akad. exper.*, No. 77, *Stockholm*, 1903. Compare Abstr., 1893, ii, 592, and 1892, ii, 187).—Of the 360 flowering plants known in Iceland, 25 per cent. are grasses or sedges. Analyses are given of twenty-five of the most important plants, collected in July or early in August. As regards the gramineous herbage, the results show higher percentages of ash and nitrogenous matter and lower percentages of cellulose than the corresponding Swedish varieties, and the digestibility of the nitrogenous matter is also relatively higher. The composition of the sedges did not differ essentially from those analysed in Sweden, except that the digestibility of the nitrogenous matter is greater in the Icelandic specimens. N. H. J. M.

Composition of Potatoes. EINAR FORFANG (*Bied. Centr.*, 1904, 33, 392—393 ; from *Tidsskr. Norsk. Landbr.*, 1903, 10, 151—162).—The average composition of ten varieties of potatoes grown in West Norway was as follows : dry matter, 24·42 ; starch, 15·15 ; sugar, 2·16 ; crude fibre, 0·66 ; furfuroids, 0·667 ; total N, 0·399 ; fat, 0·04 ; and ash, 0·98 per cent. N. H. J. M.

Poultry Feeding. FRITZ LEHMANN (*Bied. Centr.*, 1904, 33, 417—419 ; from *Landw. Jahrb.*, 1903, *Erg.-bd.*, iv, 137).—It was found, in accordance with earlier results, that crude fibre is not digested by birds. In absence of sufficient data derived from experiments with poultry, digestibility-coefficients obtained in pig-feeding experiments should be employed, although it is possible that the digestive power of poultry is somewhat less than that of pigs.

N. H. J. M.

Presence of Nitrates in Wines. W. SEIFERT and HERMANN KASERER (*Bied. Centr.*, 1904, 33, 345—347 ; from *Zeit. Landw. Versuchswes. Oesterr.*, 1903, 6, 555).— A number of samples of must, fermented with pure yeast, were found to contain nitrates. The absence of nitrates in some wines may be partly due to greater ripeness of the grapes, or to conditions of soil, manuring, and climate. It is, however, shown that wines which contain nitrates may fail to give a reaction with diphenylamine unless heated for some minutes with blood-charcoal. N. H. J. M.

Experiments with Molasses Manure. HENRIK G. SÖDERBAUM (*Bied. Centr.*, 1904, 33, 307—310 ; from *Meddel. kongl. landtbruks. akad. exper.*, No. 77, *Stockholm*, 1903).—The preparation employed was a dark brown powder having a distinct odour of beet molasses. It contained CaO, 10·35 ; K_2O (soluble in water), 10·07 ; SO_3, 16·65 ; organic nitrogen, 2·81 ; and 49·35 per cent. of non-nitrogenous organic matter.

The results of manurial experiments showed that for barley it was somewhat more effectual than potassium sulphate ; for oats, equal to sodium nitrate containing the same amount of nitrogen, and for potatoes equal as regards yield to kainite, without causing a depression in the amount of starch. N. H. J. M.

Activity of the Phosphoric Acid in Various Phosphates. OSKAR BÖTTCHER (*Bied. Centr.*, 1904, 33, 379—382 ; from *Illust. landw. Zeit.*, 1903, 23, 1063. Compare Abstr., 1903, ii, 750).—The various phosphates had very little after-effect and must be classed with the sparingly soluble phosphates which are not suitable substitutes for basic slag on ordinary (non-acid) soils. As regards basic slag, the after-effect of the two samples employed showed, as the first crop did, that the solubility in citric acid is the most important characteristic.

N. H. J. M.

Decomposition of Crude Phosphates for Manurial Purposes. A. Ystgaard (*Bied. Centr.*, 1904, 33, 419—422; from *Tekn. Ugebl.*, 50, 329—332; and *Tidsskr. norsk. Landbr.*, 1903, 10).—When a mixture of apatite and carnellite (both finely powdered) is heated for 10—15 minutes at 700—800°, a product is obtained in which 80 per cent. of the total phosphoric acid is soluble in 2 per cent. citric acid. More prolonged heating is to be avoided, as the magnesium phosphate first found is transformed into less soluble phosphates. The highest amount of soluble phosphate is obtained when a considerable excess of carnallite is employed. This, of course, lowers the percentage of total phosphoric acid and is objectionable in other respects. The most suitable mixture was found to be apatite, 100; carnallite, 200; and kieserite, 100 parts. The product then contains P_2O_5, total 20·71; soluble in 2 per cent. citric acid, 15·23; Cl, 16·47; SO_3, 19·76; CaO, 9·22; MgO, 10·20; K_2O, 6·85; and Na_2O, 1·45 per cent. Other crude phosphates may be similarly treated.

Pot experiments with oats and peas showed that the new phosphates gave better results than basic slag, being particularly favourable to seed production. This is attributed to the phosphoric acid being present as magnesium salt, and to the favourable relation, in the manure, between calcium and magnesium.

N. H. J. M.

Analytical Chemistry.

A Simple Extractor. A. Coppalle (*Ann. Chim. anal.*, 1904, 9, 161—162).—The apparatus, which is readily put together and acts like a Soxhlet apparatus, consists of a round-bottomed flask attached to a pear-shaped vessel which, in turn, is connected vertically with a condenser.

Inside the pear-shaped vessel is placed a small glass or porcelain disc, 4 or 5 millimetres thick, and furnished with two holes. This plate serves as support for a rather narrow glass funnel containing a small filter, or for a filtering tube containing asbestos or cotton-wool; the other opening admits the vapours. The substance is placed in the tared funnel or filtering tube and may be reweighed after the extraction is finished.

If the distillation is well regulated, the substance to be extracted is always covered with the solvent, and the extraction is accelerated by the constant falling of drops from the condenser. To insure the complete immersion in the solvent of the sample in all cases, the funnel may be provided with a tube bent into a S-shape which acts as a siphon as soon as the solvent has quite covered the filter and its contents.

L. de K.

Filtration and Ignition of Gelatinous Precipitates. Max Dittrich (*Ber.*, 1904, 37, 1840—1842).—For the filtration of gelatinous precipitates, such as aluminium or iron hydroxides, the following method is recommended. Before the filtration of the precipitate, filter paper, which has been disintegrated by vigorous shaking with water in a test-tube, is added. The filtration and washing of the precipitate can then be carried out much more quickly than by the usual method, since the precipitate no longer forms a gelatinous mass adhering to the sides of the filter and closing its pores. In burning precipitates treated in this manner, special care must, however, be taken that the combustion of the filter paper is complete. After ignition, the residue does not consist of hard lumps, but is a finely-divided powder. In estimating iron as oxide by this method, there is no danger of any reduction taking place during the ignition.

The advantage of the method is pointed out in several examples, as when aluminium hydroxide has to be redissolved to free it from alkali, or during the separation of iron and alumina. A. McK.

***p*-Nitrophenol as Indicator.** Leopold Spiegel (*Zeit. angew. Chem.*, 1904, 17, 715—716).—A reply to Lunge on the use of *p*-nitrophenol instead of methyl-orange as indicator. Lunge used a 0·2 per cent. solution of this indicator, whereas a 2·5 per cent. solution should have been employed.

The author withdraws a former statement that fused borax should behave differently to the crystallised salt with either *p*-nitrophenol or methyl-orange. L. de K.

Ionisation Constants of Phenolphthalein and the Use of this Substance as an Indicator. Herbert N. McCoy (*Amer. Chem. J.*, 1904, 31, 503—521).—When phenolphthalein is used in the titration of sodium carbonate solution, it is found that the quantity of acid required to discharge the colour is dependent on the amount of the indicator present. On account of this fact, it occurred to the author that by determining the ionisation constant of phenolphthalein a method might be obtained for estimating the alkalinity of solutions of sodium hydrogen carbonate. Experiments have been made in which measured quantities of ammonia, phenolphthalein, and ammonium chloride, each in $N/10$ solution, were added successively to 80 c.c. of pure water, the mixture being afterwards diluted to a total volume of 100 c.c.; the concentration of the salt formed was determined by comparing the colour of the solution with that of a solution containing 1 c.c. of N sodium hydroxide diluted to 100 c.c. with $N/12,000$ phenolphthalein. From the results of these experiments, the average value of K was found to be $1·6 \times 10^{-4}$.

It is pointed out that, the value of this ionisation constant being known, the degree of accuracy with which it is possible to titrate any acid or base of known ionisation constant can be easily calculated from a consideration of the end of the reaction from the standpoint of chemical equilibrium. It is found that phenolphthalein is an excellent indicator for almost all acids, including the so-called weak acids, but is not applicable to the weakest bases, although it can be used with many of the amines and other moderately weak bases.

It is well known that the addition of a large excess of alkali to a slightly alkaline solution of phenolphthalein causes a great diminution in colour. To explain this, it is suggested that the red salt is also an extremely weak acid which is converted into the corresponding colourless salt only by the addition of a large excess of the base. In conclusion, the question is discussed from the point of view of the constitution of phenolphthalein and its salts. E. G.

Hydrochloric Acid as a Standard Titration Liquid. W. A. Roth (*Zeit. angew. Chem.*, 1904, 17, 716—717).—Raschig (this vol., ii, 441) has proposed to prepare a hydrochloric acid of exactly known composition by passing dry hydrogen chloride into a known weight of water and reweighing. The author has also used hydrochloric acid in volumetric analysis, but prefers to ascertain the exact strength of the acid by means of a gravimetric estimation as silver chloride. It should be remembered that silver chloride should be washed with iced water as it is not altogether insoluble at a somewhat higher temperature. L. de K.

Estimation of Chlorides in Urine. Jules Ville and Eugène Derrien (*Bull. Soc. chim.*, 1904, [iii], 31, 581—585).—The authors have made a comparative study of the various methods of estimating chlorides in urine. The processes examined were Mohr's direct method, in which the urine diluted with ten times its weight of water is titrated with a standard solution of silver nitrate, using potassium chromate as an indicator, and various modifications of this in which the organic matter is first destroyed by ignition of the solid residue with sodium carbonate and potassium nitrate (Mohr) or by treatment with potassium permanganate (Denigès) or lead dioxide (Loubiou, Abstr., 1899, ii, 72), or in which its action on the silver nitrate is prevented by the addition of sodium acetate and acetic acid (Freund and Toepfer, Abstr., 1894, ii, 260), and Charpentier's process in which the titration is made in presence of nitric acid, ammonium thiocyanate and a ferric salt being used as indicators. They find that Mohr's direct process and the Freund-Toepfer modification give almost identical results, which, with urines of sp. gr. greater than 1·010, are higher than the results obtained with the other processes examined. This difference is due to the influence of the organic matter, and its magnitude is proportional in normal and albuminous urines to the density, increasing by 0·07 for every increment of 0·001 in the sp. gr. of the urine. In urines containing dextrose, this relation also holds provided that the sp. gr. of the dextrose-free liquid is taken for comparison. These results show that Mohr's direct process may be employed in estimating chlorides in urines of sp. gr. less than 1·010 and in others also provided these are suitably diluted and, where necessary, a correction for the influence of dextrose on the density is made. T. A. H.

Forms in which Sulphur occurs in Coal; their Calorific Values and their Effects on the Accuracy of the Heating Powers, calculated by Dulong's Formula. E. E. Somermeier (*J. Amer. Chem. Soc.*, 1904, **26**, 555—568).—The estimation of the calorific value of coal from the ultimate analysis involves the calorific value of the sulphur present. When the amount of sulphur is large, the question is important, especially as to how the heating value is affected by the different forms in which sulphur may occur. The author has studied the question experimentally.

Since pyrites does not burn completely in a calorimeter, the samples used were burned with coal. As an average of three determinations with one sample and four with another, the value 2637 cal. for 1 gram of pyrites was obtained. With 53·2 per cent. of sulphur in the pyrites, the calorific value per gram of sulphur as pyrites is 4957 cal.; 2915 cal. is the heat of combustion of 1 gram of sulphur as pyrites under ordinary conditions of combustion. A. McK.

Estimation of Sulphur in Oils, Bitumens, and Coals. Edmund Graefe (*Zeit. angew. Chem.*, 1904, **17**, 616—619).—The substance, if liquid, is poured on to a little cotton-wool contained in a perforated conical platinum vessel, and the increase in weight is recorded. Coals and bitumens are either taken in lump or in a compressed state. The whole is suspended in a bottle previously filled with pure oxygen and also containing a solution of sodium peroxide. The charge is fired by electricity, the conducting wires being made of copper. The sulphuric acid formed in the combustion is then estimated as usual in the alkaline solution. L. de K.

Action of Sodium Nitroprusside on Alkalis, Carbonates, Hydrogen Carbonates, and Ammonia. C. Reichard (*Zeit. anal. Chem.*, 1904, **43**, 275—279).—A very dilute solution of sodium or potassium hydroxide, mixed with sodium nitroprusside, develops a yellow coloration. No such effect is produced by sodium or potassium carbonate; on the contrary, the addition of a normal or acid alkali carbonate to the yellow mixture reduces the depth of the colour, or in large excess destroys it altogether. The action of ammonia is somewhat similar to that of the alkali hydroxides, but a very much stronger solution is required to produce the yellow colour. M. J. S.

Estimation of Nitrogen in Foods and Physiological Products. Henry C. Sherman, C. B. McLaughlin, and Emil Osterberg (*J. Amer. Chem. Soc.*, 1904, **26**, 367—371).—A series of experiments showing that the Kjeldahl process in its various modifications is not always completed when the acid mixture has been boiled until colourless. The following modification gives satisfactory results with proteid and related compounds. The sample is heated with 20 c.c. of sulphuric acid and 0·7—1 gram of mercury until frothing ceases; 10—15 grams of potassium sulphate are added, and the whole is then boiled as usual. After some 30 minutes, the mixture is generally colourless, but the boiling should then be continued for at least another half hour.

L. de K.

Sprengel's Method for the Colorimetric Estimation of Nitrates. Launcelot W. Andrews (*J. Amer. Chem. Soc.*, 1904, **26**, 388—390).—The product formed in the action of Sprengel's reagent (phenol-*p*-sulphonic acid with excess of sulphuric acid) on small quantities of nitrates appears to be *o*-nitrophenol-*p*-sulphonic acid. As in alkaline solution this compound shows the same depth of colour as *p*-nitrophenol, a standard comparison liquid for Sprengel's process may be conveniently made by dissolving 0·993 gram of *p*-nitrophenol in a litre of water; 1 c.c. of this represents 0·1 mg. of nitrogen. For use, a definite amount is taken and rendered alkaline with potassium hydroxide. L. de K.

Analysis of Sodium Nitrite. Georg Lunge (*Chem. Zeit.*, 1904, **28**, 501—502).—Schultz has modified his process for the titration of sodium nitrite by means of sodium sulphanilate, the end reaction being now ascertained by an immediate reaction on potassium iodide-starch paper, which should persist for a few minutes. Although the author agrees that, with care, good results may be obtained, he still prefers for commercial disputes his permanganate process. In this process, the solution of the nitrite (23 grams per litre) is added from a burette to 45 c.c. of *N*/2 permanganate diluted with 400 c.c. of water at 40° and acidified with sulphuric acid. The permanganate must be standardised with technically pure sodium nitrite. The end reaction is shown by the complete decolorisation of the liquid. L. de K.

Estimation of Phosphoric Acid as Magnesium Pyrophosphate. K. K. Järvinen (*Zeit. anal. Chem.*, 1904, **43**, 279—282).—If phosphoric acid is precipitated with magnesia mixture under unsuitable conditions, an error either of excess or deficiency, which may reach 3 per cent., may be incurred. The following procedure will insure an exact result—The phosphate solution is mixed with ammonia until the odour can just be detected. The solution is then poured slowly, and with stirring, into a neutral mixture of magnesium chloride and ammonium chloride (10 c.c. for 0·1 gram of phosphoric oxide of a solution containing 102 grams of magnesium chloride and 53 grams of ammonium chloride per litre). The free ammonia in the phosphate solution should be completely absorbed by the formation of the precipitate; should the mixture thereafter smell of ammonia, some trimagnesium phosphate will be formed. A 0·5 per cent. solution of ammonia is now to be added very slowly until the mixture has a strong ammoniacal odour, and finally 1/3 the volume of 10 per cent. ammonia. Filtration may take place after 2 hours, and if the filter is burnt apart from the precipitate the latter will be obtained perfectly white and of constant weight after a single ignition. M. J. S.

Estimation of Minute Quantities of Arsenic in Copper Ores and Metallurgical Products. Thomas C. Cloud (*J. Soc. Chem. Ind.*, 1904, **23**, 524—526).—The ore is digested with sulphuric and nitric acids on a water-bath until decomposed. The solution is then evaporated and heated on a sand-bath until nearly all excess of sulphuric acid has been removed. When cool, the residue is dissolved in water, filtered, and the copper in the filtrate deposited electrolytically. The electrolysis is stopped whilst the solution still contains from 0·05 to 0·08 gram of copper, a previous estimation of the copper in another portion of the ore having been made. The solution, together with all the deposit on the anode, is evaporated to a small volume and gradually introduced into a Marsh apparatus. The tube containing the mirror of arsenic is cut off at the end of the operation and weighed. After dissolving the mirror in nitric acid, the tube is washed, dried, and reweighed, the difference between the two weighings giving the amount of arsenic. W. P. S.

Determination of the Calorific Power of Blast-furnace Gases by means of the Calorimetric Bomb. Georges Arth (*Bull. Soc. chim.*, 1904, [iii], 31, 576—578).—The author points out that Mahler's calorimetric bomb (Abstr., 1892, 260) is unsuited to the determination of the calorific value of mixtures of combustible gases owing to practical difficulties of manipulation and to the smallness of the rise in temperature which could be obtained even under the best conditions, He suggests instead that the maximum calorific value should be calculated after the composition of the mixture has been ascertained by analysis. T. A. H.

Use of Sodium Peroxide in the Qualitative Analysis of Organic Substances. Hans H. Pringsheim (*Ber.*, 1904, **37**, 2155—2156. Compare this vol., ii, 146).—The ignition of organic substances with sodium peroxide may be employed for the rapid and simultaneous qualitative detection of the halogens, phosphorus, arsenic, and sulphur. A mixture of sodium peroxide with 1/25th part of an organic, non-hygroscopic substance, such as naphthalene or cinnamic acid, is prepared and stored. The substance to be tested is added to a small quantity of this mixture in an iron vessel, and heated until the reaction occurs. The mass is then dissolved in water, and the elements named are tested for in the usual manner. C. H. D.

Volumetric Method for the Estimation of Carbon Dioxide. Thomas Macara (*Analyst*, 1904, **29**, 152—153).—The process is based on the fact that barium carbonate behaves like an alkali towards methyl-orange. A known quantity of the sample is placed in a flask provided with a tapped funnel and a delivery tube. The latter passes into a second flask containing saturated barium hydroxide solution. By the addition of hydrochloric acid to the evolution flask and subsequently boiling the contents, all the carbon dioxide is driven off, and absorbed in the second flask. The excess of free barium hydroxide in the latter is then neutralised with $N/2$ hydrochloric acid, using phenolphthalein as indicator. Methyl-orange is added and the barium carbonate titrated with $N/10$ hydrochloric acid. The usual precautions are necessary when hydrogen sulphide, sulphur dioxide, chlorine, bromine, or oxides of nitrogen are present in the sample.

W. P. S.

Portable Outfit for the Estimation of Carbon Dioxide, Dissolved Oxygen, and Alkalinity in Drinking Water. Fred B. Forbes (*J. Amer. Chem. Soc.*, 1904, **26**, 382—388).—A fully illustrated arrangement for testing waters, suitable for field work. The estimations are made by the usual processes. L. de K.

Action of Sodium Picrate on Sodium Carbonate Solutions. C. Reichard (*Zeit. anal. Chem.*, 1904, **43**, 269—275).—Sodium carbonate seems to possess a specific property of precipitating sodium picrate from solution. A single drop of a cold saturated solution of the picrate added to 10 c.c. of a 1 per cent. solution of the carbonate produces a slight turbidity, and with increasing concentration of the carbonate solution, or larger quantities of the picrate, the phenomenon becomes still more conspicuous. Sodium hydrogen carbonate, sodium phosphate, and sodium sulphate exhibit no such effect, but their presence even in relatively large quantities does not inhibit the action of the normal carbonate. M. J. S.

Volhard's Silver Estimation. Copius Hoitsema (*Zeit. angew. Chem.*, 1904, **17**, 647—650).—An adverse criticism on Rose's improved Volhard's process (Trans., 1900, **77**, 232). Although this modification has rendered the reaction more sensitive, it has not improved the accuracy of the process, as the precipitated silver thiocyanate retains free silver nitrate or potassium thiocyanate. L. de K.

Estimation of Calcium. Engelbert Kettler (*Zeit. angew. Chem.*, 1904, **17**, 685—686).—A process devised for operators who have only spirit lamps at their disposal. The calcium oxalate, obtained in the usual manner, is ignited to carbonate, which is then dissolved in a sufficiency of dilute hydrochloric acid and precipitated by adding dilute sulphuric acid and four times the bulk of absolute alcohol. The calcium sulphate is then collected, washed with alcohol, dried, and ignited, the filter being burnt separately. L. de K.

Estimation of Molybdenum and Tungsten and their Separation from Mercury by the Aid of Hydrazine. Paul Jannasch and W. Bettges (*Ber.*, 1904, **37**, 2219—2228).—Mercury may be readily separated from molybdenum (in the form of a molybdate) by reduction with hydrazine sulphate in the presence of tartaric or citric acid (2—3 grams) at 80°. The precipitated mercury is then dissolved and estimated as sulphide. Mercury may also be separated from tungsten (as tungstate) by precipitation with an ammoniacal solution of hydrazine sulphate at 70—80°. The addition of citric or tartaric acid is not necessary.

Tungsten may readily be estimated in tungstates by precipitating as the trioxide with hydrazine chloride in the presence of free hydrochloric acid. J. J. S.

Separation of Manganese. Otto Foerster (*Chem. Zeit.*, 1904, **28**, 457—459).—When estimating manganese in the ashes of plants or in soils by means of the persulphate process, or by means of hydrogen peroxide, it is, according to the author, very essential to first remove any phosphoric acid; this may be done conveniently by either the tin, mercury, or molybdate method. L. DE K.

Separation of Iron and Zirconium and other Metals by means of Nitroso-β-naphthol. GEORG VON KNORRE (*Zeit. angew. Chem.*, 1904, 17, 641—647, 676—678).—Iron may be quantitatively separated from zirconium by means of nitroso-β-naphthol. The precipitate, after being washed, is at once gradually ignited and so converted into oxide. In the presence of oxalic acid, the iron is not precipitated unless some hydrochloric acid is added to the hot solution. Tartaric acid, on the other hand, does not interfere with the precipitation.

The zirconium, also aluminium, chromium, &c., may then be estimated in the filtrate after destroying the organic matters by means of hydrochloric acid and potassium chlorate. L. DE K.

Estimation of Minute Quantities of Bismuth in Copper and Copper Ores. THOMAS C. CLOUD (*J. Soc. Chem. Ind.*, 1904, 23, 523—524).—The colorimetric method proposed is based on the fact that lead iodide, when precipitated in the presence of bismuth, assumes a more or less red tint. The solutions employed consist of (*a*) bismuth nitrate, prepared by dissolving pure bismuth oxide in nitric acid and diluting so that 1 c.c. is equivalent to 0·0001 gram of bismuth; (*b*) lead nitrate, made by dissolving 6 grams of pure lead in nitric acid, evaporating, and diluting to 1000 c.c.; (*c*) 35 grams of potassium iodide in 4000 c.c. of water. A suitable quantity of the metallic copper under examination is dissolved in nitric acid and neutralised by the cautious addition of sodium carbonate, so that only a small precipitate is produced. After 3 hours, the solution is filtered, the precipitate is dissolved in dilute hydrochloric acid, and reprecipitated with hydrogen sulphide. The precipitate so obtained is dissolved in nitric acid and diluted to 250 c.c. One hundred and twenty-five c.c. are treated with 5 c.c. of the lead solution, the mixture is neutralised with ammonia and ammonium carbonate and finally ammonia are added in excess. After warming, the precipitate is collected on a filter and washed with ammonium carbonate solution until free from copper. The precipitate is then dissolved in nitric acid, evaporated, taken up with water and nitric acid, and transferred to a graduated cylinder. The coloration produced on adding 25 c.c. of the potassium iodide solution is compared with that obtained with known quantities of the bismuth nitrate and lead nitrate solutions. The contents of the cylinders are well mixed, and the final comparison is made after the lapse of 20 minutes.

In the case of copper ores, the latter are dissolved in a mixture of nitric and sulphuric acids, evaporated, treated with water and a drop or two of hydrochloric acid, and filtered. The solution is now treated with hydrogen sulphide and the process completed as described for metallic copper.

It is stated that 0·00001 gram of bismuth can be estimated by this method. W. P. S.

Estimation and Separation of Platinum from Potassium Sodium, Barium, Strontium, Calcium, Magnesium, Manganese, Tungsten, Cobalt, Nickel, Copper, Zinc, and Cadmium in Ammoniacal Solution by means of Hydrazine. PAUL JANNASCH and C. STEPHAN (*Ber.*, 1904, **37**, 1980—1992. Compare Abstr., 1899, ii, 59).—On gradually adding ammonia to a boiling solution of potassium platinichloride containing hydrazine hydrochloride, the platinum is quantitatively precipitated in the metallic state; the potassium can be estimated in the filtrate. A similar separation can be effected in the case of a mixture of potassium platinichloride with a calcium, strontium, barium, or magnesium salt, but when a zinc or cadmium salt is used, part of the platinum remains in solution; in the case of zinc, 50—70 per cent., and in that of cadmium 40—60 per cent., of the platinum is precipitated. When a manganese salt is present, part of the manganese is precipitated as oxide, but by dissolving this away from the platinum by means of hot nitric acid containing hydrogen peroxide, correct values are obtained for the platinum. Platinum can be separated quantitatively from tungstic acid by means of hydrazine, but molybdic acid undergoes reduction to lower oxides in such a manner as to render the estimation of platinum impracticable. Nickel is partly, and cobalt nearly, completely reduced to the metallic state simultaneously with the platinum, whilst copper is quantitatively precipitated as metal; in all three cases, the co-precipitated metal can be dissolved away from the platinum by means of nitric acid, and the estimation of both metals made possible. In presence of a cyanide, the precipitation of platinum is always incomplete. W. A. D.

Estimation of Palladium and Separation from other Metals by means of Hydrazine. III. PAUL JANNASCH and W. BETTGES (*Ber.*, 1904, **37**, 2210—2219. Compare Abstr., 1899, ii, 59, and preceding abstract).—The product obtained by the reduction of palladium salts with hydrazine sulphate and subsequent ignition, is a mixture of oxides which may be reduced to the metallic state by heating in a current of hydrogen. Palladium may be estimated by this process when the precipitation is carried out in a hot solution acidified with about 20 drops of dilute hydrochloric acid, the precipitate collected on a funnel-shaped asbestos filter tube, dried, and reduced.

No reduction occurs when the hydrazine is used at the ordinary temperature. Palladium may be separated from potassium, sodium, magnesium, zinc, and iron by similar methods, and these metals may then be estimated in the filtrates. In the case of magnesium and zinc, it is not necessary to destroy the excess of hydrazine sulphate used in the precipitation of the palladium. J. J. S.

Iodine Absorption as a Factor in the Examination of Otto of Roses. FREDERICK HUDSON-COX and WILLIAM H. SIMMONS (*Analyst,* 1904, **29**, 175—178).—Twenty samples of otto of roses, which had previously been examined by the ordinary methods and found to be of good quality, gave iodine values (Hübl) varying from 187 to 194. Several samples of artificial otto and of oils used as adulterants gave iodine values of well over 200, geranium oil being the lowest with a value of 213. Citral and citronellol, however, were found to have iodine values of 175 and 187 respectively. It is worthy of note that, whilst artificial otto is considerably deodorised by iodine, the odour of the natural oil is not affected. W. P. S.

Estimation of Methyl Alcohol in Formaldehyde. ROBERT GNEHM and FELIX KAUFLER (*Zeit. angew. Chem.*, 1904, 17, 673—676).—Twenty-five c.c. of water are heated to boiling in a distilling flask and 90 grams of crystallised sodium sulphanilate are gradually added, and the boiling continued until all is dissolved. The contents are now rapidly cooled while stirring with a glass rod. To the crystalline mass is now added 20 c.c. of the formaldehyde to be tested, and, after closing the flask, the whole is left for 3 or 4 hours; 1½—2 hours is long enough if the flask is put into a water-bath at 35—40°. The formaldehyde has now entered into combination, whilst the methyl alcohol is unaffected and may be recovered by connecting the flask with a suitable condensing apparatus and collecting the first 35 c.c. which pass over. These are then made up to 50 c.c. and the amount of methyl alcohol is found from the sp. gr. of the solution at 15°. A sp. gr. table is given. L. DE K.

Estimation of Alcohol in Wine. E. MARTIN (*Rev. intern. Falsif.*, 1904, 17, 48—49).—Ten c.c. of the wine are diluted to a volume of 50 c.c. Of this solution, 10 c.c. are placed in a flask of 50 c.c. capacity and distilled, the distillate being collected in a second flask containing 25 c.c. of potassium dichromate solution and 10 c.c. of sulphuric acid. The dichromate solution contains 42·6087 grams of the pure dry salt per litre and 1 c.c. corresponds with 0·01 gram of alcohol. At the conclusion of the distillation, the excess of dichromate is titrated with ferrous ammonium sulphate solution in the usual manner.

W. P. S.

Volumetric Estimation of Sugar. LEOPOLD ROSENTHALER (*Zeit. anal. Chem.*, 1904, 43, 282—285).—The products of the oxidation of dextrose and lævulose by alkaline copper solution are acids, and the amount of sugar oxidised can be estimated by the amount of alkali which these acids neutralise. The copper solution recommended is composed of 17·5 grams of crystallised copper sulphate, 75 grams of glycerol, 125 grams of sodium citrate, 100 grams of 15 per cent. sodium hydroxide solution, and water to 1 litre. The solution should be filtered after remaining for 3 or 4 days, or heating for a few hours on the water-bath, and then undergoes no further alteration on keeping. About 0·05 gram of sugar in 1 per cent. solution is mixed with a small excess (30 c.c.) of the copper solution, and boiled for 5 minutes. The precipitate is removed by a Gooch filter and washed with 150 c.c. of water. The filtrate is mixed with an excess of *N*-sulphuric acid, then nearly neutralised, boiled for 10 minutes, and exactly titrated with *N*-alkali and phenolphthalein. The original solution is titrated in the same manner: 1 c.c. of *N*-acid corresponds with 0·0225 gram of anhydrous dextrose or lævulose. M. J. S.

Formaldehyde in Wine. F. MALLMANN (*Zeit. öffentl. Chem.*, 1904, 10, 165—166).—The author has recently met with a preservative powder for wine which was found to consist of formaldehyde and sodium chloride. It was sold under the name "Sterilisol."

With regard to the detection of formaldehyde in wine, it is pointed out that the phenylhydrazine reaction also gives a coloration with acetaldehyde. W. P. S.

Estimation of Formaldehyde and its Polymerides. ADOLPHE SEYEWETZ and GIBELLO (*Bull. Soc. chim.*, 1904, [iii], 31, 691—694).—When a standard solution of sulphuric acid is added to a solution of sodium sulphite and trioxymethylene tinted with phenolphthalein, the quantity of acid necessary to effect decolorisation is proportional to the amount of trioxymethylene present. Lemme has suggested that the addition of sulphuric acid under these conditions results in the formation of sodium hydrogen sulphite, which is removed from the sphere of action by combination with the trioxymethylene. The authors have applied this reaction to the estimation of formaldehyde and its polymerides. Twenty c.c. of a 20 per cent. solution of sodium sulphite to which one drop of 0·2 per cent. solution of phenolphthalein in alcohol has been added is just decolorised by the addition of *N*-sulphuric acid. From 0·5 to 0·7 gram of trioxymethylene is then added, and the solution is again titrated with *N*-sulphuric acid until the pink colour disappears. This method gives results agreeing with those obtained by the processes of Legler (Abstr., 1883, 1035) and Losekann (Abstr., 1889, 1036), and is more easy to carry out.

T. A. H.

Estimation of Aldehydes in Wines and Spirits. L. MATHIEU (*Rev. intern. Falsif.*, 1904, 17, 43—45).—One hundred c.c. of wine are placed in a 120 c.c. flask, 1 gram of tartaric acid and 0·03 gram of sulphurous acid are added, and, after mixing, the flask and its contents are placed in the dark for 4 hours. The sulphurous acid may be added in the form of sodium hydrogen sulphite solution, 20 c.c. of which should contain 0·03 gram of sulphurous acid. At the end of 4 hours, the contents of the flask are transferred to a beaker, a few drops of starch solution are added, and then iodine solution until a blue coloration appears. Sufficient sodium arsenite solution is now added to destroy the excess of iodine and the combined sulphurous acid estimated by de Haas' method (Abstr., 1902, ii, 582).

In the case of red wines, the starch indicator is used in the form of drops on a white tile. For estimating aldehydes in spirits, 2 grams of tartaric acid and 0·4 gram of sulphurous acid should be added.

The amount of barium sulphate obtained multiplied by 1·884 gives the weight of acetaldehyde present. W. P. S.

Estimation of Volatile Acidity in Wines. LUCIEN ROBIN (*J. Pharm. Chim.*, 1904, [vi], 19, 531—533).—Water is boiled in a conical flask fitted with a safety funnel. The steam escapes through two separate delivery tubes and is passed through two receivers each containing 10 c.c. of a sample of wine to be tested. The whole is placed on an iron stand covered partly with copper gauze, on which rests the steam-generating flask, and partly with a sheet of copper which supports the two receivers, the contents of which are also kept near the boiling point by means of the specially constructed burner.

After the current of steam has passed through for about 40 minutes, the remaining acidity is titrated as usual and the result deducted from the total acidity represents the volatile acidity. L. DE K.

Detection of Thiocyanic Acid in Saliva. EGIDIO POLLACCI (*Ann. Chim. anal.*, 1904, 9, 162).—The test is based on the partial reduction of mercurous chloride by potassium thiocyanate. In order to detect a thiocyanate in saliva, a little calomel is placed in a small capsule, 10—12 drops of the saliva are added, and the mixture is stirred with a glass rod; after a few minutes, a precipitate of metallic mercury will be noticed. The supernatant liquid contains mercuric thiocyanate, which develops a red coloration on adding ferric chloride.

L. DE K.

Detection and Chlorimetric Estimation of Salicylic Acid. CARLO MONTANARI (*Gazzetta*, 1904, 34, i, 290—292).—Under the conditions used by Spica (Abstr., 1895, ii, 426) in his method for determining salicylic acid, products other than picric acid are obtained, especially nitrosalicylic acids. The transformation into picric acid becomes complete, however, even with very minute quantities of salicylic acid, when sufficient nitric acid is taken to allow of boiling the liquid for several minutes. Only then can concordant results be obtained. T. H. P.

Composition of Milk. H. DROOP RICHMOND (*Analyst*, 1904, 29, 180—187).—The average composition of 15,313 samples of milk analysed during the year 1903 is given. The figures for the morning and evening milk for each month are given separately. The average percentage of fat (3·83) for the year was slightly higher than in 1902 (3·82) and, as usual, the poorest milk occurred in June, whilst the richest was found in October and November.

To ascertain whether the geological formation has any influence on the composition of milk, supplies from farms on four different formations were separately examined. It is, of course, doubtful whether the chief influence is not due to the surface soils, modified as they are by artificial manuring. The formations chosen comprised the new red sandstone, Oxford clay, upper green sand, and chalk. The only conclusion to be drawn from the results of the analyses is that the milk raised on the two cretaceous formations tends to be better in quality than the others; but the difference is not marked.

The author also discusses Storch's theory that the fat globules in milk are surrounded by a semi-solid membrane of mucoid substance, and considers that this assumption must be regarded as disproved.

W. P. S.

Decrease in the Amount of Citric Acid in Milk on Heating. GUSTAV OBERMAIER (*Arch. Hygiene*, 1904, 50, 52—65).—The results of the author's investigation show that the citric acid naturally present in milk diminishes in quantity when the latter is heated. For temperatures between 75° and 80°, the decrease is proportionately small, but when the milk is boiled or heated in an autoclave at 120°, the decrease in the amount of citric acid is very marked, in some cases reaching 30 per cent. of the total quantity. Scheibe's method (Abstr., 1891, i, 1276) was used for the estimation of the citric acid.

W. P. S.

Estimation of Fat in Cheese. MORITZ SIEGFELD (*Milch-Zeit.*, 1904, 33, 289—292).—The various methods recommended for this estimation are compared with one another. The processes investigated included direct extraction of the cheese, after grinding it up with sand and drying, with ether or light petroleum; dissolving the cheese in hydrochloric acid before extracting; Gottlieb's ammonia-alcohol-ether process, and finally that of Gerber. The results obtained by the different methods agreed well with each other. In the case of cheese made from skimmed milk, direct extraction gave slightly lower results, and in using the Gottlieb process incorrect amounts of fat were sometimes obtained owing to incomplete solution of the casein. The hydrochloric acid method is considered the best for general use, but Gerber's method is also trustworthy provided that the lower meniscus is taken in reading off the volume of the fat. W. P. S.

Estimation of Fat and Sugar in Molasses Foods. D. J. HISSINK (*Landw. Versuchs-Stat.*, 1904, 60, 125—134).—Fat was estimated (1) by extracting the dried substance with ether; (2) by extracting after washing out with water; and (3) by Berntrop's method (Abstr., 1902, ii, 366), using 100 c.c. of 10 per cent. hydrochloric acid and 50 c.c. of water with 5 grams of the dried substance. Berntrop's method gave the highest results and the first method the lowest.

The following method was employed for estimating the sugar. The molasses (25 grams) is agitated with 400 c.c. of water in a half-litre flask for half an hour, the whole made up to 500 c.c., and left for half an hour. Two hundred c.c. are then drawn off into a quarter-litre flask and the estimation continued according to the Dutch method. The solution is treated successively with lead acetate and sodium carbonate, being filtered after each addition, neutralised with hydrochloric acid, and inverted by heating on boiling water-bath for 30 minutes with 30 c.c. of $N/10$ hydrochloric acid. N. H. J. M.

Estimation of Morphine in Opium. PHILIP SCHIDROWITZ (*Analyst*, 1904, 29, 144—148).—Six grams of opium are thoroughly mixed into a paste with 6 c.c. of water and then transferred to a counterpoised 100 c.c. Erlenmeyer flask. Water is then added to bring the weight of the contents up to 54 grams. The flask, after corking, is shaken for 1 hour, the contents being then poured on a filter and the filtrate collected in a second counterpoised flask. Exactly 42 grams of filtrate are collected, 2 grams of a 50 per cent. sodium salicylate solution are added, the mixture is shaken for half a minute, and filtered. To 36 grams of the filtrate, 15 c.c. of ether are added, and also 5·2 c.c. of ammonia solution, prepared by mixing 17 grams of ammonia of sp. gr. 0·960 with 83 grams of water. The whole is then shaken for 10 minutes and placed aside for 24 hours. As much as possible of the ether is now poured on to a filter, 15 c.c. of fresh ether are added to the flask, and, after well shaking, also passed through the filter together with the whole of the liquid contents of the flask. The crystals remaining in the flask are washed with 3 successive quantities of 5 c.c. of water saturated with ether, about 3 c.c. being used to rinse the flask and 2 c.c. run directly on the filter. The latter and its contents are then pressed between blotting-paper, the greater part of the crystals are returned to the flask, and both filter and flask dried at a temperature of 55°. Any crystals remaining on the filter are then readily transferred to the flask. The crystals are now dissolved in 25 c.c. of *N*/10 sulphuric acid, the solution is diluted to 50 c.c. with water, and the excess of acid titrated back, using methyl-orange as indicator. The percentage of morphine is calculated from the formula: $x \times 0{\cdot}7575 + \frac{1}{13}(x \times 0{\cdot}7575) =$ morphine per cent., where x equals the number of c.c. of *N*/10 acid employed.

W. P. S.

Estimation of Vegetable Proteids. L. Beulaygue (*Compt. rend.*, 1904, 138, 701—703).—The total amount of proteids is estimated by heating the dry powdered substance (4 grams) for 10 minutes with 100 c.c. of water at the boiling point. Alum (0·5 gram) and glacial acetic acid (4 c.c.) are then added and the heating continued for 5 minutes longer. The undissolved substance is washed and dried, and the nitrogen determined.

The proteids insoluble in water are estimated in a similar manner, omitting treatment with alum and acetic acid, and the amount of soluble proteids is obtained by deducting the result from the total proteids.

The total indigestible proteid (including nucleins and lecithins) is estimated by digesting the substance (4 grams) with pepsin and hydrochloric acid at 37—40° for 12—15 hours. The undissolved nitrogen is estimated in the usual manner. The nucleins alone can be estimated in the undissolved residue obtained by macerating the dried substance (after digestion) for 24 hours with 50 c.c. of a mixture of ether and alcohol (equal vols.).

N. H. J. M.

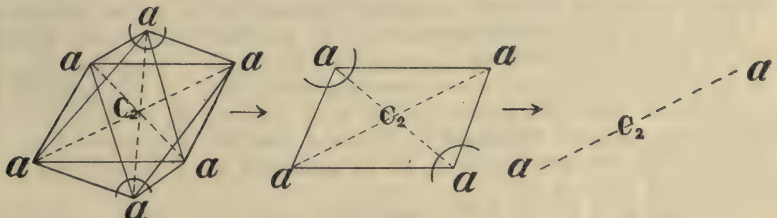
Polariscopic Estimation of Gliadin in Wheat-Flour. Harry Snyder (*J. Amer. Chem. Soc.*, 1904, 26, 263—266).—15·97 grams of the sample of flour are treated with 100 c.c. of 70 per cent. alcohol, and the whole is gently shaken at intervals of half an hour for two hours; too violent shaking is apt to produce a turbid filtrate. After further contact with the alcohol for 12 to 18 hours, the liquid is polarised at 20° in the 22 cm. tube. The reading expressed in sugar multiplied by 0·2 approximates very closely to the percentage of gliadin-nitrogen in the sample.

L. de K.

General and Physical Chemistry.

Stereochemistry of Carbon Compounds, especially of Unsaturated Systems. PAUL PFEIFFER (*Zeit. physikal. Chem.*, 1904, 48, 40—62).—The consequences of the van't Hoff-Wislicenus theory, dealing with the isomerism of maleic and fumaric acids and of ethylenic substances in general, are not always in harmony with the experimental facts (compare Michael, Abstr., 1893, i, 145). Thus, in conflict with the theory, addition of hydrogen chloride, hydrogen bromide, or bromine to acetylenedicarboxylic acid produces principally substances of the fumaroid form, whilst, conversely, compounds of the fumaric acid type pass more readily than those of the maleic acid type into acetylene derivatives.

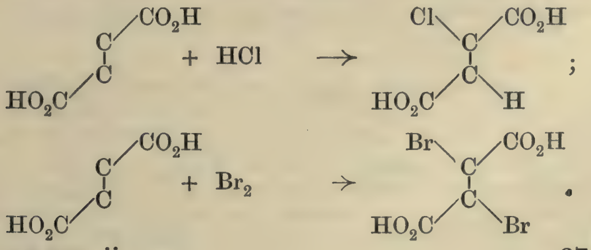
To adapt the theory to the facts, the author gives up the idea of double and triple linkings, and also the conception of valency as a definitely directed single force (compare Lossen, Abstr., 1888, 218). He further represents the compound C_2a_6 by a regular octahedron with the C_2 complex at the centre. The compound C_2a_4 is then derived from C_2a_6 by the removal of two *a* groups at opposite corners of the octahedron, a plane four-sided figure being left. C_2a_2 is then derived from C_2a_4 by the removal of two diametrically opposite *a* groups. These relationships are represented diagrammatically thus:



C_2a_6. C_2a_4. C_2a_2.

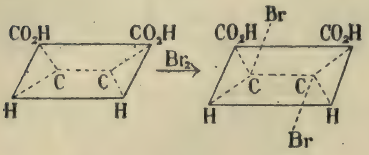
There is a marked analogy between the space formulæ here suggested for the C_2 substances and those developed by Werner for inorganic molecular compounds (compare Werner, Abstr., 1893, ii, 379).

When substances of the acetylene type are regarded as essentially *trans*-forms in the way shown above, then the production of chloro- and dibromo-fumaric acids by addition of hydrogen chloride and bromine respectively to acetylenedicarboxylic acid becomes intelligible, thus:

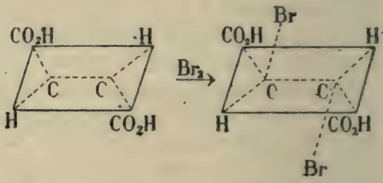


Similarly, the more ready conversion of the halogen fumaric acids into acetylenedicarboxylic acid is satisfactorily accounted for, as is also the fact that from the silver salt of bromomaleic acid carbon dioxide and silver bromide are eliminated more readily than from the silver salt of bromofumaric acid.

The author further shows that the conversion of maleic acid into the dibromosuccinic acid (m. p. 160°), which corresponds with racemic acid, and of fumaric acid into the dibromosuccinic acid (m.p. 255°), which corresponds with mesotartaric acid, is to be expected from the formulæ given above, thus:



Maleic acid.



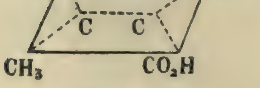
Fumaric acid.

An adequate interpretation of the oxidation of maleic and fumaric acids in terms of the author's system is more difficult, but can be given on the supposition that an oxide is first produced, and that the dihydroxysuccinic acids are secondarily formed by the action of water.

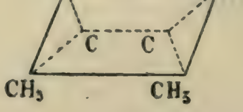
Extending these considerations to other ethylenic compounds which do not give anhydrides, and in regard to which the important point is their relationship to the corresponding compounds of the acetylene and ethane types, the author arrives at a number of formulæ which differ from those of Wislicenus. Thus, of the following pairs of compounds, the first-mentioned is to be regarded as a *trans*-form, the second as a *cis*-form:

Crotonic acid (m. p. 72°); *iso*crotonic acid (m. p. 15°); α-chlorocrotonic acid (m. p. 97°); α-chloro*iso*crotonic acid (m. p. 66°); β-chlorocrotonic acid (m. p. 94°); β-chloro*iso*crotonic acid (m. p. 61°); α-bromocrotonic acid (m. p. 106°); α-bromo*iso*crotonic acid (m. p. 92°); dibromocrotonic acid (m. p. 95°); dibromo*iso*crotonic acid (m. p. 120°) (compare Bruni and Gorni, Abstr., 1899, ii, 731).

Of the two monobromobutylenes, the one boiling at 93—94° must be the *cis*-compound, because potassium hydroxide converts it only with difficulty into crotonylene; the one boiling at 87—88° is easily decomposed by potassium hydroxide, and is therefore the *trans*-form. Hence angelic and tiglic acids must have the configurations:



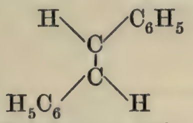
Angelic acid



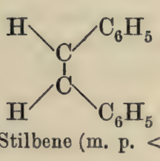
Tiglic acid.

Of the two butylenes, the one boiling at 2·5° is the *cis*-form; the one boiling at 1·5° is the *trans*-form.

Of the two monobromostilbenes, the one melting at 31° must be the *trans*-form, since hydrogen bromide is more easily removed from it than from bromo*iso*stilbene (m. p. 19°). Hence the configurations of the two stilbenes are:



Stilbene (m. p. 124°).



*iso*Stilbene (m. p. <0°).

J. C. P.

Configuration of Maleic and Fumaric Stereoisomerides and of the Corresponding Acetylene Compounds. Giuseppe Bruni (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 626—632).—The author discusses the views of Pfeiffer (preceding abstract) in conjunction with the work published during the last few years by himself, Garelli and Calzolari, Boeris, and Mascarelli, and gives the following tabular *résumé* of the results obtained:

Saturated compounds.	Compounds not forming solid solutions with saturated compounds.	Compounds forming solid solutions with saturated compounds.	
	Ethylenic compounds.	Ethylenic compounds.	Acetylenic compounds.
Ethyl dimethylsuccinate (19°)	Ethyl dimethylmaleate (liqd.)	Ethyl dimethylfumarate (102°)	Ethyl dimethylacetylenedicarboxylate.
Butyric acid (4°)	*iso*Crotonic acid (liqd.)	Crotonic acid (72°)	—
Phenylpropionic acid (48°)	Allocinnamic acid (69°)	Cinnamic acid (133°)	Phenylpropiolic acid
Dibenzyl (52°)	*iso*Stilbene (liqd.)	Stilbene (124°)	Tolane
Dimethyldibenzyl (82°)	—	*pp*-Dimethylstilbene (177°)	—

The numbers in brackets in the above table represent melting points.

The general conclusions drawn by the author are that: (1) all the compounds in the third column of the table possess configurations corresponding with those of the respective saturated compounds (the fumaroid structure), and with this their physical and chemical properties are in accord, for (*a*) they all have melting points higher than those of their isomerides given in the second column and higher by 70—90° than those of the corresponding saturated compounds, (*b*) they are all less soluble than their isomerides, and (*c*) they are all more stable than their isomerides, which are transformed into them with ease, for example, by the action either of traces of iodine or of light. (2) The compounds in the second column have a maleinoid configuration. T. H. P.

Fluorescence. V. The Benzene Ring-system. Hugo Kauffmann and Alfred Beisswenger (*Ber.*, 1904, 37, 2612—2617).—The following table shows how the fluorescence and colour of 3-aminophthalimide varies with the solvent, but is not directly related to the dispersion (Kundt's rule):

	Fluorescence.	Colour.	Dispersion of Solvent.
Water	green	yellow	326
Acetic acid	↓	│	374
Alcohol (absolute)	blue-green	│	330
*iso*Butyl alcohol	│	│	378
Pyridine	│	│	—
Amylene	↓	↓	461
Chloroform	blue	pale yellow	—
Acetone	│	│	388
Anisole	↓	│	1086
Thiophen	blue-violet	│	1086
Ether (absolute)	↓	↓	351
Benzene	violet	colourless	1056

This change is characteristic of all fluorescent, and also appears in the non-fluorescent amines, and is not hindered by substituting alkyl or aryl groups. As the molecular weight is normal even in associating solvents, the conclusion is drawn that the change of colour is not due to reversible isomeric or polymeric change, but rather to the distortion of the benzene ring-system. T. M. L.

Origin of Radium. Herbert N. McCoy (*Ber.*, 1904, 37, 2641—2656. Compare Rutherford and Soddy, Abstr., 1903, ii, 463).—Radioactivity accompanies or is caused by decomposition of the active substance. The apparent permanency of radium must be due to the extreme slowness of its decomposition, and its present existence can be explained only by supposing it to be formed by the decomposition of another substance, to which it must stand in the same relation as thorium X to thorium. The fact that radium is found in many uranium minerals suggests that these elements are genetically related. If radium is a decomposition product of uranium, then all uranium minerals should contain radium in a constant proportion to the uranium present. In agreement with this, the activity constant K, which is the radioactivity of a given mass divided by the percentage of uranium present, for pure uranium salts is 3·86, whilst for twelve samples of uranium minerals, K is found to be 18·9—24·7 (mean 22·1). The radioactivity of a uranium mineral is 5·7 times that of the pure uranium salt obtained from it. As the activity of radium is $1·5 \times 10^6$ greater than that of uranium, it follows that one part by weight of radium is contained in a mineral containing 300,000 of uranium.

The author concludes that radium is a member of the following series of successive decomposition products of uranium: U ⟶ UX ⟶ Ra ⟶ Ra Em ⟶ EmX ⟶ He. G. Y.

Properties and Changes of Radium Emanation. Sir William Ramsay (*Compt. rend.*, 1904, **138**, 1388—1394).—The radium emanation was collected from a solution of 70 mg. of radium bromide in water, which yields also electrolytic gases containing an excess of hydrogen; the gas was exploded and the residual hydrogen and radium emanation dried, transferred to a small glass vessel, and cooled in liquid air; this caused the radium emanation to condense, and the tube became so luminous that the face of a watch could be clearly seen by its light; the hydrogen was removed by means of a mercury pump until the escaping bubbles of gas were slightly luminous, due to the appreciable vapour pressure of the radium emanation even at the temperature of liquid air. After the removal of the hydrogen, the radium emanation was rendered gaseous and a series of measurements of the volume and pressure were made; the results showed that the emanation is a true gas obeying the Boyle-Mariotte law, the mean value of the product VP being 19·3, and corresponding to a volume of 0·0254 cm. at normal pressure. The volume of the radium emanation gradually diminished and the luminosity faded, until at the end of a month all luminosity had disappeared; on gently warming the tube, a quantity of gas four times the volume of the original emanation was obtained, and this gas gave the spectrum of helium.

The remainder of the paper is a summary of the work described in the following abstract. M. A. W.

Spectrum of the Radium Emanation. Sir William Ramsay and J. Norman Collie (*Proc. Roy. Soc.*, 1904, **73**, 470—476).—The spectrum of the emanation from radium bromide has been mapped with as great exactness as possible, and the observed lines are recorded in the paper. A considerable difficulty, however, arises, in that, although the spectrum of the emanation is very brilliant at first, it is in a few minutes completely masked by the hydrogen spectrum. The origin of this hydrogen is matter of speculation: it may have come from the electrodes; the emanation may not have been completely dried, or hydrogen may be one of the disintegration products of the emanation as well as helium.

The authors consider that sufficient evidence has now been accumulated showing that the emanation from radium is an element, although a transient one. It is a gas, and follows Boyle's law; it resembles the gases of the argon series in its indifference to chemical reagents; its molecular weight has been found to be nearly 200. For this element, the authors suggest the name "exradio." J. C. P.

Penetrating Radium Rays. J. A. McClelland (*Phil. Mag.*, 1904, [vi], **8**, 67—77).—The author has endeavoured to discover whether the γ-rays carry any positive or negative charge, without, however, arriving at any definite result (compare Paschen, this vol., ii, 461). As shown by Rutherford, the absorption of γ-rays by different substances is roughly proportional to their density, but for denser substances the ratio of the coefficient of absorption to the density is greater than the normal value, being twice as great for lead as for water. Further experiments made by the author show that when the rays have passed through some thickness of the denser substances, the coefficient of absorption is diminished, so that the law that the coefficient of absorption is proportional to the density is then followed very closely. J. C. P.

Origin of the Energy Emitted by Radioactive Substances. C. Bonacini (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 466—473).—No experiments have yet been made to determine whether the source of the energy of radioactive substances is intramolecular change or absorption of an unknown form of energy coming from outside. In order to obtain information on this point, the author has carried out the following experiment. A radioactive substance was enclosed in a covering opaque to radioactive rays, together with a substance for indicating its action, for instance, one which changes colour under the influence of the rays emitted. In a second similar arrangement, the opaque screen was surrounded with radioactive material. If the source of the energy of radioactive matter is external, the enclosed substance should, after some time, be less active in the second case than in the first. With the but slightly active material at the author's disposal, no such difference could be detected. T. H. P.

Testing of Minerals for Radioactivity. Felix Pisani (*Chem. Centr.*, 1904, i, 1433 ; from *Bull. Soc. franç. Min.*, 27, 58—63).—In order to test minerals for radioactivity the specimens are placed above a small triangular hole cut in a sheet of metal which is laid on the sensitive plate. After remaining from 1 to 24 hours, the images are developed and compared. From the results obtained, it appears that all the radioactive minerals, with the exception of the coloured fluorspars, and other minerals which contain organic pigments, are characterised by containing either oxide of uranium or of thorium or both. It is doubtful, however, whether the 1 to 3 per cent. of these oxides which is present in some of the minerals is sufficient to wholly account for their great radioactivity. E. W. W.

Pyroradioactivity. Thomas Tommasina (*Arch. Sci. phys. nat.*, 1904, [iv], 17, 589—596).—Metals, when heated by an electric current, become radioactive and are capable of discharging electroscopes, &c. All the metals emit rays capable of discharging either electrification, but the difference between the two actions is generally very great. Iron, copper, and platinum produce a more rapid discharge of negative electrification, whilst for silver and zinc the opposite is the case. If the current increases, however, the difference between the two effects tends to disappear, and at bright incandescence the metal discharges both electrifications almost equally. The radioactivity of a metallic thread heated to redness by a current diminishes along an asymptotic curve, but its power is regained by rest for some time, or by light friction. When the radioactivity has become weak, it continues for some time after the heating of the current, but is lost if the wire is struck. A mantle of glass or aluminium surrounding the wire also becomes radioactive. Three types of emissions exist: the α, easily arrested by screens, the β, more penetrative, and the γ, which discharge either electrification, induce fluorescence, &c. They are, however, less penetrative than the γ-rays of radium. L. M. J.

Rate of Decay of Thorium Emanation. C. Le Rossignol and C. T. Gimingham (*Phil. Mag.*, 1904, [vi], 8, 107—110).—The authors find that the time required for thorium emanation to decay to half-value is 51 seconds, instead of 60 seconds, as found by Rutherford (Abstr., 1900, ii, 351). J. C. P.

The Property a Large Number of Substances Possess of Projecting Spontaneously and Continuously a Ponderable Emanation. R. Blondlot (*Compt. rend.*, 1904, 138, 1473—1476).—The author describes a series of experiments in which a screen of phosphorescent calcium sulphide was found to glow more brightly when a silver coin was placed near it. The relative positions of the coin and screen for points of maximum brightness indicate that the coin emits a ponderable emanation normal to its surface and with a small velocity, the path of which is not parabolic, but a curve with a vertical asymptote; when this emanation strikes the screen, it causes an increase in the luminosity of the calcium sulphide. Similar results were obtained with copper, zinc, lead, or moist cardboard instead of the silver coin, but gold, platinum, glass, or dry cardboard were inactive in this respect. The emanation can penetrate a sheet of paper or cardboard, or even a 2 cm. plank, but it is stopped completely by a sheet of glass. M. A. W.

A Phenomenon analogous to Phosphorescence produced by *n*-Rays. E. Bichat (*Compt. rend.*, 1904, 138, 1316—1318).—Blondlot has shown (compare *Compt. rend.*, 1903, 137, 729) that certain substances are capable of absorbing *n*-rays and emitting them after the removal of the original source of the rays; on heating such a substance, there is a temporary increase in the number of the secondary rays, followed by a rapid disappearance of the same; this phenomenon is analogous to the behaviour of ordinary phosphorescent substances when heated. An examination of the indices of refraction of these secondary rays, using Blondlot's method (compare *Compt. rend.*, 1904, 138, 125), shows that they conform to Stokes' law, the wave-length of the secondary ray being longer than that of the primary. Copper, zinc, and glass have the property of absorbing *n*-rays, whilst platinum, silver, or aluminium have not, and there is no relation between this property of emitting secondary rays and transparency to *n*-rays, for platinum is opaque, whilst silver and aluminium are transparent. M. A. W.

Emission of n- and n_1-Rays by Crystalline Substances. E. BICHAT (*Compt. rend.*, 1904, 138, 1396—1397).—Positive crystals such as quartz, apophyllite, brucite, cassiterite, or zircon emit n-rays in the direction of the axis, and n_1-rays in a direction at right angles to this, whilst negative crystals, such as iceland spar, corundum, emerald, idocrase, or oligiste, do just the reverse, emitting n_1-rays in the direction of the axis, and n-rays in a normal direction. A thick sheet of ordinary glue emits n_1-rays in a direction normal to the plane and n-rays in a direction at right angles to it; this is in keeping with Bertin's observation that a pile of thin sheets of gelatin behaves like a uniaxial positive crystal (compare *Ann. Chim. Phys.*, 1878, [v], 15, 129). Tourmaline behaves in this respect as a normal negative crystal, but if it be warmed it becomes pyroelectric, and the positively charged pole of the crystal causes an increase in the luminosity of a phosphorescent screen, whilst the negatively charged pole causes a diminution in the same. M. A. W.

Use of n-Rays in Chemistry. ALBERT COLSON (*Compt. rend.*, 1904, 138, 1423—1425. Compare this vol., ii, 377).—When barium hydroxide solution is added to zinc sulphate solution, the whole of the zinc is precipitated in the form of the basic salt, $SO_4(Zn{\cdot}O{\cdot}ZnOH)_2$, by three-fourths of the quantity of the base equivalent to the metallic salt, and the heat development accompanying this reaction is 17·8 Cal.; if, however, the zinc sulphate solution be added to the barium hydroxide solution, zinc hydroxide is formed accompanied by an emission of n-rays and a thermal change of 13·4 Cal. The results are analogous to those obtained with zinc sulphate and potassium hydroxide (this vol., ii, 377), and similar results were obtained with copper sulphate and barium hydroxide. M. A. W.

Action of Sources of n-Rays on Pure Water. JULIEN MEYER (*Compt. rend.*, 1904, 138, 1491—1492).—When water is subjected to the action of a source of n-rays, it becomes itself a source of n_1-rays; this is shown by the following experiments: (1) when a file is placed below a crystallising dish containing water, above the surface of which is a screen of calcium sulphide, the phosphorescence of the screen diminishes as the file approaches the dish, whereas the ordinary effect of the n-rays is produced if the dish contains no water; (2) when a file, or any other source of n-rays, is plunged into pure water contained in a glass vessel, the phosphorescence of a calcium sulphide screen held near to the vessel is diminished, showing that the water has become a source of n_1-rays; (3) a vessel of water containing a frog, or the green parts of a plant, is also a source of n_1-rays. The addition of a few drops of chloroform to the water destroys its power of emitting n_1-rays, and the source of the n-rays then exerts its characteristic action on the phosphorescent screen. A similar series of experiments in which a source of n_1-rays was used, instead of a source of n-rays, showed that water is transparent to these rays, and the addition of chloroform to the water did not modify in any way the normal action of the n_1-rays. M. A. W.

Influence of Pressure on the E.M.F. of Gas Electrodes. Theodor Wulf (*Zeit. physikal. Chem.*, 1904, **48**, 87—96).—The decomposition point observed galvanometrically is the point at which the discharged gas ions dissolve appreciably in metal and electrolyte. The point at which bubbles are visibly formed is reached when the gas is evolved from a saturated solution. The latter point is dependent, the former point is not dependent, on the pressure, as might be expected from the fact that the evolution of gaseous bubbles means a large increase of volume, whilst the process of solution in metal or electrolyte does not involve any such great volume change. The two points nearly coincide when the gas in question is but slightly soluble, as, for instance, hydrogen and oxygen at the ordinary pressure. They are quite distinct, however, in the case of a soluble gas such as chlorine.

Helmholtz's formula for the variation of the *E.M.F.* of the hydrogen electrode with pressure has been verified for the range 1—1000 atmospheres. J. C. P.

Behaviour of Glycogen under the Influence of the Electric Current. Madame Z. Gatin-Gruźewska (*Pflüger's Archiv*, 1904, **103**, 287—288).—Glycogen behaves like other colloids and wanders to the anode. W. D. H.

Liquefied Hydrides of Phosphorus, Sulphur, and the Halogens as Conducting Solvents. I. Douglas McIntosh and Bertram D. Steele (*Proc. Roy. Soc.*, 1904, **73**, 450—453).—As a preliminary to the main investigation, a number of physical constants of the above-mentioned solvents have been measured. The vapour pressure curves have been determined by the method of Travers, Senter, and Jaquerod, and from these curves the following melting and boiling points have been read: hydrogen chloride, b. p. − 82·9°; hydrogen bromide, m. p. − 86°, b. p. − 68·7°; hydrogen iodide, m. p. − 50·8°, b. p. − 35·7°; hydrogen sulphide, b. p. − 60·1°; hydrogen phosphide, b. p. − 86·2°. The densities of the liquids were determined over a wide temperature range, and the values at the boiling point for hydrogen chloride, bromide, iodide, sulphide, and phosphide are respectively 1·195, 2·157, 2·799, 0·964, 0·744. A study of the molecular surface energy shows that of the substances examined the bromide, iodide, and sulphide occur as simple molecules, whilst the chloride and phosphide are more or less associated. The viscosities also have been measured, and the following temperature-coefficients of viscosity have been obtained: hydrogen chloride, 0·88; hydrogen bromide, 0·57; hydrogen iodide, 0·70; hydrogen sulphide, 1·10. In the preliminary investigation, the organic ammonium salts were found to dissolve readily to conducting solutions, the conductivity of which increased enormously with increasing concentration, in sharp contrast to the behaviour of aqueous solutions (see also following abstract). No metallic salts appeared to dissolve; at any rate, none were found to conduct the current. Hydrogen chloride and bromide dissolve readily in liquid hydrogen sulphide, but give non-conducting solutions.

J. C. P.

Liquefied Hydrides of Phosphorus, Sulphur, and the Halogens as Conducting Solvents. II. EBENEZER H. ARCHIBALD and DOUGLAS MCINTOSH (*Proc. Roy. Soc.*, 1904, 73, 454—455. Compare preceding abstract).—In hydrogen chloride, bromide, iodide, and sulphide, many organic substances are readily soluble, such as amine salts, acid amides, certain alkaloids, alcohols, ethers, ketones, phenols, and some organic acids and esters. In every case where a conducting solution is formed, the dissolved substance contains an element (nitrogen or oxygen) the valency of which may be increased. In every one of the large number of solutions examined, the molecular conductivity was found to increase enormously with increasing concentration. The solutions rarely conduct better than *N*/25 KCl. Many temperature-coefficients have been determined, and these are found to be positive in the majority of cases. All the experiments go to indicate that the current is carried by the dissolved organic substance, not by the hydride. Discussion of the results is postponed until the molecular weights of the dissolved substances and the transport numbers have been determined. J. C. P.

Anodic Behaviour of Copper and Aluminium. FRANZ FISCHER (*Zeit. physikal. Chem.*, 1904, 48, 177—219. Compare Abstr., 1903, ii, 587).—Details are given of work already described in outline (*loc. cit.*). J. C. P.

Electrolysis of Alkali Chlorides. II. A. TARDY and PHILIPPE A. GUYE (*J. Chim. phys.*, 1904, 2, 79—123. Compare this vol., ii, 29).—The present paper treats of the function of the diaphragm during electrolysis. The diaphragm is the seat of four principal phenomena: (1) physical diffusion of the alkali from the cathode to the anode liquid, (2) migration of hydroxyl ions, (3) electrical endosmosis by which the anode liquid traverses the diaphragm, (4) flow of liquid from cathode to anode consequent on alteration of level due to 3. These effects are separately considered; the last is completely eliminated when the cathode solution is continually replenished and kept at a constant level. Characteristic constants for the different effects may be calculated from knowledge of the porosity and permeability of the diaphragm, and results of measurements with different diaphragms are given. In order to obtain the maximum yield of alkali, it is necessary to keep the levels of anode and cathode liquids equal and to employ a current density of sufficient magnitude to cause the endosmotic current to nullify that in the opposite sense due to diffusion. The latter may be done by altering the current for a given diaphragm or by choosing the latter with a permeability suited to the current employed. L. M. J.

Some Considerations in Support of the Theory of "Mobile Ions." ALBERT REYCHLER (*J. Chim. phys.*, 1904, 2, 307—320).—The following views are put forward by the author. When a salt dissolves in water, it forms with some of the simple molecules of water (present in but small numbers) saline systems composed of equivalent quantities of acid and base; this reaction, being reversible, may be represented thus: $MX + 1/n(H_2O)_n \rightleftarrows MOH + HX$, so that a limiting value of the dissociation is reached. The constitutive parts of these saline systems are osmotically active, and hence the dissociation may be obtained from ebullioscopic or cryoscopic measurements. The conductivity is due to the reversibility, the equilibrium being dynamic, not static, so that under the directive influence of the electric tension the systems become $\ldots . + (\overset{+}{M}\overset{-}{X} + HOH) + (\overset{+}{M}\overset{-}{X} + HOH) + \ldots\ldots \rightleftarrows \ldots . \overset{+}{M} + (X\overset{-}{H} + \overset{+}{M}OH) + (H\overset{-}{X} + HO \ldots .$, and hence separation of the ions M and X ensues. The conductivity is hence given by expression $\mu_v = x(u+v)$. The theory also explains the approximate constancy of the heats of neutralisation, thus: $(\overset{+}{M}OH + H\overset{-}{O}H) + (H\overset{-}{X} + \overset{+}{H}OH) = (\overset{+}{M}OH + H\overset{-}{X}) + 2/n(H_2O)_n$, the heat developed being due to the formation of polymerised from simple water molecules. In the ordinary dissociation theory, it has to be assumed that the separation of the ions of a compound develops heat, a contradiction of thermal ideas. The author points out that the theory also does not necessitate the attributing of incomprehensible properties to the free ions, and explains equally well the catalytic decomposition of sucrose, methyl acetate, &c., by weak acids. In reply to sundry objections, it is stated that the electromotive force expression $E = K\left(\log\frac{P}{p} - \log\frac{P'}{p'}\right)$ is given equally well by this theory if P and P' are understood to measure the tendency of the metals to form oxides saturated by acid, and p, p' are attributed to the molecules $Zn(OH)_2$, &c., in the saline systems at the electrodes. L. M. J.

Ionic Reactions in Organic Chemistry. Walther Löb (*Zeit. Elektrochem.*, 1904, 10, 367—368).—A claim for priority. T. E.

Combination of a Solvent with the Ions. J. Livingston R. Morgan and C. W. Kanolt (*J. Amer. Chem. Soc.*, 1904, 26, 635—637). When a solution of silver nitrate and pyridine is submitted to electrolysis, a loss of pyridine occurs at the anode, and a corresponding gain at the cathode. Preliminary experiments with copper nitrate and water dissolved in alcohol indicated that in this case the quantity of water decreases at the anode and increases at the cathode. It is therefore concluded that when a substance undergoes ionisation on passing into solution, one or both of the ions form complex ions with a certain amount of the solvent.

By applying the law of mass action to such cases, the following results are obtained. When complex ions are formed from the simple ions but neither condenses, the equilibrium is in accordance with Ostwald's dilution formula. If two ions of one kind combine with the solvent to form one complex ion, that is, one ion condenses whilst the other does not, or if both ions condense, the equilibrium is expressed by van't Hoff's form of Rudolphi's dilution formula.

E. G.

Determination of the Concentration of the Hydrogen Ions in a Solution by means of Indicators. EDUARD SALM (*Zeit. Elektrochem.*, 1904, 10, 341—346).—Friedenthal (this vol., ii, 288) determined the concentration of the hydrogen ions in a series of standard solutions by means of their electrolytic conductivity. The author has redetermined these concentrations more accurately by means of concentration cells with hydrogen electrodes. The following table contains the results, the concentrations being given in gram equivalents per litre :

Concentration of solution.	Concentration of H ions.	Concentration of solution.	Concentration of H ions.
0·001*N* HCl	$1{\cdot}11 \times 10^{-3}$	0·001*N* KOH	$2{\cdot}6 \times 10^{-11}$
0·0001*N* HCl..................	$0{\cdot}996 \times 10^{-4}$	0·0102*N* KOH	$1{\cdot}3 \times 10^{-12}$
0·1*N* NaH_2PO_4 (solution *a*)	$3{\cdot}3 \times 10^{-5}$	0·104*N* KOH	$1{\cdot}29 \times 10^{-13}$
2 c.c. sol. *b* + 8 c.c. sol. *a*	$1{\cdot}5 \times 10^{-6}$	1·38*N* KOH	$1{\cdot}02 \times 10^{-14}$
4 ,, ,, + 6 ,, ,, ,,	$4{\cdot}9 \times 10^{-7}$	3·8*N* KOH	$3{\cdot}1 \times 10^{-15}$
6 ,, ,, + 4 ,, ,, ,,	$1{\cdot}9 \times 10^{-7}$		
8 ,, ,, + 2 ,, ,, ,,	$6{\cdot}5 \times 10^{-8}$		
0·1*N* Na_2HPO_4 (solution *b*)	$1{\cdot}3 \times 10^{-9}$		

The most strongly acid solutions could not be used, because the hydrogen carried away hydrogen chloride with it and so diminished the concentration. Very dilute solutions of acids or alkalis are not suitable owing to the large influence of the variable small quantities of impurity in even the purest water (see also Salessky and Fels, this vol., ii, 319—320). A solution containing 2×10^{-10} gr. eq. H ions per litre is prepared by diluting 60 c.c. *N*/100 KOH with *N*/10 NaCl to 1 litre. In addition to the indicators mentioned by Friedenthal, alizarin-green changes from lilac to flesh-pink between 2*N* and *N*H˙, from brownish-yellow to green between 1×10^{-13} and 1×10^{-14}*N*H˙, and from flesh-pink to brownish-yellow between 1×10^{-7} and 1×10^{-9}*N*H˙. Alizarin changes from yellow to orange between 1×10^{-5} and 1×10^{-6}*N*H˙, from orange to red between 1×10^{-7} and 1×10^{-10}*N*H˙, and from red to a violet precipitate between 1×10^{-13} and 1×10^{-14}*N*H˙. T. E.

Thermal Ionisation of Salt Vapours. GEORGES MOREAU (*Compt. rend.*, 1904, 138, 1268—1269).—A current of air which has been passed through an aqueous solution of the salt under investigation is then conducted through a porcelain tube heated at 1000°, in which its electrical conductivity is measured. For a solution of given concentration, the observed current is at first proportional to the difference of potential, but approximates to a limiting value as the voltage increases. For very dilute solutions of the same salt, this maximum current is proportional to the concentration, but tends to a limit as the concentration is increased. Of the salts examined, those of potassium are the best conductors, and the chloride, bromide, iodide, and nitrate conduct three or four times as well as other potassium salts. The salt vapours in these experiments are ionised, but the phenomena differ considerably from those observed in flames containing salt vapours (Abstr., 1903, i, 600). H. M. D.

Magnetic Susceptibility of Alloys of Bismuth and Tin. S. C. Laws (*Phil. Mag.*, 1904, [vi], 8, 49—57).—The addition of tin to bismuth is accompanied by a diminution of the diamagnetic properties of the metal. As in the case of other properties, the effect is most marked when the proportion of added tin is small.

J. C. P.

New Thermometer for Cryoscopic and Ebullioscopic Measurements at Low Temperatures. Giuseppe Magri (*Gazzetta*, 1904, 34, i, 387—388).—In carrying out cryoscopic or ebullioscopic measurements in liquefied gases by means of a differential thermometer of the Walferdin type containing methyl alcohol and a drop of mercury as indicator, it sometimes happens that the mercury falls into a position where the temperature is so low as to solidify it. In order to prevent this, and hence any possibility of the bulb being broken when the alcohol becomes warmer and expands, the author introduces into the horizontal tube, near the bend, a small bulb. This is found to act as a perfect safeguard. T. H. P.

Thermal Properties of Salicylaldehyde. Wladimir F. Luginin (*J. Chim. phys.*, 1904, 2, 1—6).—The specific heat of salicylaldehyde was found to be 0·4540 and the latent heat of vaporisation 74·89 cal. The latter number gives 19·45 for the Trouton constant, a value which, although low, is near to the value 20·3 obtained for benzaldehyde. The compound does not therefore appear to be polymerised, so that the introduction of the hydroxyl group does not here cause polymerisation. The author now considers that it appears probable that polymerisation depends more on the type of compound than on the introduction of a hydroxyl group (Abstr., 1903, ii, 7).

L. M. J.

Congruent and Incongruent Liquid Products in the Case of Double Salts. Wilhelm Meyerhoffer (*Zeit. physikal. Chem.*, 1904, 48, 109—112. Compare Abstr., 1901, ii, 639).—A binary double salt and its components have either one incongruent and one congruent melting point or three congruent melting points. A similar remark applies to salt hydrates, for they have either one incongruent melting point (transition point) and one congruent melting point (cryohydric point) or three congruent melting points, as in the case of the hydrate, $CaCl_2,6H_2O$. J. C. P.

Boiling Point Apparatus. Johan F. Eykman (*J. Chim. phys.*, 1904, 2, 47—51).—The paper contains a figure and description of a form of apparatus for the determination of boiling points, in which the solution is heated by the vapour of the pure solvent. The apparatus has the advantage of being entirely of glass, without corks or india-rubber, and its trustworthiness is indicated by tables of results obtained with solutions in various solvents. L. M. J.

Boiling Points under Different Pressures of Naphthalene, Diphenyl, and Benzophenone. ADRIEN JAQUEROD and EUGÈNE WASSMER (*J. Chim. phys.*, 1904, **2**, 52—78).—The boiling points of the three compounds were determined by means of a hydrogen thermometer, and a diagram and description of the apparatus are given. The boiling points were obtained at pressures varying from 300 to 800 mm., and cover a field of temperature ranging from 190° to 308°. Great precautions were taken to ensure accuracy, and examples illustrative of the accuracy of the results are given with the complete tables. The author considers that these compounds should be of great value when a constant temperature between the above limits is required, as they can be more readily purified than those substances the vapour pressure curves of which were determined by Ramsay and Young, and they also suffer no change during the boiling. L. M. J.

The Slope of the Vaporisation Neutral Curve. JOSEPH E. TREVOR (*J. Physical Chem.*, 1904, **8**, 341—350).—A mathematical paper in which the form is deduced for the expansion curve in which a diabetic expansion causes neither evaporation nor condensation.

L. M. J.

Vapour Pressures in the System: Benzene, Carbon Tetrachloride, and Ethyl Alcohol. II. FRANS A. H. SCHREINEMAKERS (*Zeit. physikal. Chem.*, 1904, **48**, 257—288).—The data recorded in the earlier paper are further discussed and applied. J. C. P.

Cryoscopic Study of Solutions in Sulphide of Antimony. JOSEPH GUINCHANT and PAUL CHRÉTIEN (*Compt. rend.*, 1904, **138**, 1269—1272).—The lowering of the temperature of solidification of fused antimony sulphide (540°) on the addition of silver sulphide or lead sulphide has been measured. The two series of data give 790 as the molecular lowering of the freezing point. From the equation $k = 0{\cdot}02T^2/L$, the heat of fusion of the sulphide is calculated to be 16·7 Cal., which is in good agreement with the value 17·5 Cal. obtained directly by calorimetric measurements.

Metallic antimony dissolves in the molten sulphide, and the lowering of the freezing point produced decreases rapidly with increasing concentration. If, however, the experimental data are extrapolated to zero concentration, the value 113 is obtained as the mol. weight of the dissolved antimony (at. wt. = 120). It is, however, possible that reaction takes place according to the equation $Sb + Sb_2S_3 = Sb_3S_3$, and the nature of the solution cannot be definitely determined from the experimental data. H. M. D.

Thermochemical Considerations. ANTONIO QUARTAROLI (*Gazzetta*, 1904, **34**, i, 293—323).—The author attempts to apply the principles of vectors to thermochemical calculation, especially with reference to heats of combination. In this way, he arrives at the following laws: (1) if two elements, A and B, are capable of yielding two compounds, AB and AB_2, the coefficient by which it is necessary to multiply the heat of formation of AB to obtain the heat developed in the reaction $AB + B$ will be the smaller as the heat of formation of AB becomes greater. (2) If two elements form different compounds of the types $AB, AB_2, \ldots\ldots AB_n$, the heat developed in the successive combinations tends to become constant, and can only vary appreciably in the case of the first compound. (3) If, however, A is not an element, but a moderately complex radicle, and B an element or radicle much less complex than A, a slight decrease occurs in the heat developed in the reactions $A+B$, $AB+B$, &c. T. H. P.

Heat of Combustion of Some Polymeric and Isomeric Compounds produced by the Action of Light. C. N. Riiber and J. Schetelig (*Zeit. physikal. Chem.*, 1904, **48**, 345—352).—The heats of combustion of the yellow and white cinnamylidenemalonic acids (compare Liebermann, Abstr., 1895, i, 470; Riiber, Abstr., 1902, i, 617) are respectively 6·056 and 6·055 Cal. per gram; those of cinnamic and α-truxillic acids (compare Riiber, Abstr., 1902, i, 785) are 7·047 and 7·039 Cal. per gram. Thus, allowing for the experimental error, there is no energy change involved in the transformations of the above acids. For the sake of comparison, the authors record also the following heats of combustion (per gram substance): tetramethylenedicarboxylic acid, 4·462 Cal. (Stohmann); acrylic acid (solid), 4·534 Cal.; cinnamylideneacetic acid, 7·535 Cal.; *allo*cinnamylideneacetic acid, 7·586 Cal. (compare Liebermann, *loc. cit.*). J. C. P.

Standard of Relative Viscosity. "Negative Viscosity." William W. Taylor (*Proc. Roy. Soc. Edin.*, 1904, **25**, 227—230).—In the formula $\eta = \eta_0 . st/s_0t_0$, where η_0, s_0, t_0 are the viscosity, density, and time of flow respectively through a tube of a given volume of a standard liquid, and η, s, t are the corresponding data for the liquid under examination, the viscosity of the solvent at the temperature of the experiment is generally taken as $\eta_0 = 1$. It is suggested that it would be better to take the viscosity of water at 0° as the standard, and to refer the relative viscosity of liquids and solutions to this alone. The bearing of this on "negative viscosity" is indicated.

A. McK.

Viscosity of Aqueous Solutions of Chlorides, Bromides, and Iodides. William W. Taylor and Clerk Ranken (*Proc. Roy. Soc. Edin.*, 1904, **25**, 231—241).—Taylor and Inglis (*Phil. Mag.*, 1903, [vi], **5**, 312) have shown that the rate of evolution of hydrogen from the action of aluminium on sulphuric acid is increased by the addition of a small quantity of potassium chloride, whilst the addition of an equivalent amount of potassium bromide has no effect. Subsequent investigation has shown that, under similar conditions and with solutions of pure hydrochloric acid and hydrobromic acid with the same concentration of hydrogen ions, the rate of evolution of hydrogen from hydrochloric acid is about thirty times as great as from hydrobromic acid. The authors have determined the relative viscosity of solutions of chloride, bromide, and iodide under varying conditions of temperature and concentration with the view of finding whether those marked differences between chloride and bromide mentioned manifest themselves in other physical properties.

The relative viscosity of aqueous solutions of potassium chloride, potassium bromide, potassium iodide, hydrochloric acid, and hydrobromic acid respectively was determined at 0°, 15°, and 25°, and at concentrations of 1 mol., 2 mols., and 3 mols. per litre. The equivalent conductivity of the same solutions at 0° was also determined.

The change of viscosity with change of temperature diminishes from chlorine to bromine and from bromine to iodine. The effect of concentration on the viscosity depends on the temperature ; it may affect the viscosity in opposite directions at different temperatures.

There are considerable differences in viscosity of chloride, bromide, and iodide, and especially in the effect of changes in concentration and temperature. A. McK.

Molecular Weights of Liquids. CLARENCE L. SPEYERS (*Amer. J. Sci.*, 1904, [iv], 17, 427—436).—The author considers it undesirable to speak of associated molecules when there is not purely chemical evidence that such association exists. He suggests the term "activity factor" in place of what is generally termed "association factor." When $a > 1$, therefore, depressed chemical activity is to be expected, whilst increased chemical activity termed electrolytic dissociation is indicated by $a < 1$. In a system of two liquid components forming two phases, by application of the formula $n/N = (p - p')/p'$ (see Abstr., 1902, ii, 388), and recollecting that the vapour pressure of each component must be the same in the two phases, the author shows that the activity factor of each liquid is increased by the effect of the other. The activity factors of aniline in mixtures of aniline and amylene are calculated, and it is seen that the factor increases very greatly to a concentration of about 75 per cent. of aniline, after which it decreases. The activity factors of nitrobenzene in various solutions were also calculated; for this compound, the values do not show so great an increase, except in the case of solutions in pentane, in which two phases exist. L. M. J.

Theory of Capillarity. GERRIT BAKKER (*Zeit. physikal. Chem.*, 1904, 48, 1—39).—A physical and mathematical paper. J. C. P.

Velocity of Diffusion of Water through a Semi-permeable Membrane. JOH. ŠEBOR (*Zeit. Elektrochem.*, 1904, 10, 347—353).—A membrane of copper ferrocyanide formed on the outside of a porous cell is used ; after very thorough washing with water, the cell is filled with distilled water and immersed in solutions of various substances, and the rate at which water diffuses out of the cell determined by observing the fall of level in a graduated tube attached to the cell. Using solutions of sucrose, it is shown that the rate of diffusion (c.c. per hour) is proportional to the osmotic pressure of the solution. The constant (rate of diffusion/osmotic pressure) is, for a given membrane, the same for all substances (sucrose, dextrose, and mannitol were tried). The constant increases rapidly with the temperature. It is obvious that when the diffusion constant has been found for a given membrane, a measurement of the rate of diffusion through the membrane can be used to calculate the osmotic pressure of the solution, and so to calculate the molecular weight of the dissolved substance.

Several experiments of this kind are made with barium chloride, raffinose, dextrin, and dextrose; the results agree approximately with theory. In the case of dextrose, the osmotic pressure remained unchanged when the rotatory power diminished to about one-half its initial value. T. E.

Anodic Behaviour of Tin, Antimony, and Bismuth. KARL ELBS and H. THÜMMEL (*Zeit. Elektrochem.*, 1904, 10, 364—367).—A tin anode dissolves in solutions of sodium chloride, or sulphate, or hydrochloric or sulphuric acids almost entirely in the stannous condition. Antimony and bismuth, in sodium chloride or hydrochloric acid, dissolve entirely in the tervalent form. T. E.

Saturation by the Method of Air-bubbling. HECTOR R. CARVETH and ROY E. FOWLER (*J. Physical Chem.*, 1904, 8, 313—324). —Experiments were made to determine the accuracy of the method for the determination of the vapour pressure of a solution which consists in the estimation of the moisture carried over when a known volume of air is bubbled through the solution. The authors, from analogy with the solution of salts, considered it probable that the air would be saturated with moisture if it were first nearly saturated at a higher temperature and then passed through the solution at the temperature desired. The experiments were hence carried out thus: dry air was passed through (1) the liquid to be investigated at the desired temperature, (2) the liquid at a higher temperature, (3) liquid as in No. 1, (4) absorption bulbs. The liquid employed was pure water. The results indicate the great difficulty of obtaining accuracy, and that the method requires very careful examination before new results obtained by its use are accepted. L. M. J.

Velocity of Absorption of Gaseous by Solid Substances. ARTHUR HANTZSCH (*Zeit. physikal. Chem.*, 1904, 48, 289—329).—The cases studied were the absorption of ammonia by solid organic acids and of hydrogen chloride by solid organic bases. The absorbent solid was obtained in a finely divided condition by grinding it with powdered glass, and the gas to be absorbed was in some experiments undiluted, in others diluted with air. When the gas is undiluted or present in the diluted form in very large excess, the course of the absorption is in general governed by the equation for a reaction of the first order. When the gas is present in molecular quantity and mixed with air, the course of absorption is governed by the equation for a reaction of the second order.

With acids whose dissociation constants can be readily determined, the absorption velocity constant for ammonia varies with the strength of the absorbent acid, but much less markedly than the dissociation constant; thus, the absorption constant for trichloroacetic acid is only about one and a half times as great as that for monochloroacetic acid under the same conditions, whilst the corresponding dissociation constants are approximately as 1000 : 1. The value of the absorption constant diminishes rapidly as the initial ammonia concentration diminishes. Absorption constants are obtained also for substances of a very weak acidic character, such as α- and β-naphthols, phenol, *p*-cresol, and *anti*benzaldoxime. In these cases, the order of value of the constants is much more distinctly the order of the acidic strength. The fact that an absorption velocity constant can be got at all appears to be characteristic of true acids, for with pseudo-acids no constant can be obtained, as will be shown in detail in a later paper.

Absorption constants for hydrogen chloride with basic substances such as *p*-toluidine, tribromoaniline, α- and β-naphthylamines, carbamide, and benzidine can also be obtained, and their determination furnishes a method of distinguishing true and pseudo-bases. To the absolute values of these absorption velocity constants no great importance is attached, because of their dependence on the conditions of the experiment. J. C. P.

Solubility of Hydrogen and Nitrous Oxide in Water as Affected by Different Dissociated Substances. W. Knopp (*Zeit. physikal. Chem.*, 1904, 48, 97—108. Compare Braun, Abstr., 1900, ii, 529).—The author finds the coefficient of absorption of hydrogen in pure water at 20° to be 0·01883, of nitrous oxide 0·6270. The solubility of hydrogen in solutions of chloral hydrate diminishes almost in a linear manner with the concentration of the latter. In solutions also of ammonium, sodium, and potassium nitrates and potassium chloride, the absorption coefficient is lowered, the extent of the lowering being greater for sodium nitrate than for potassium nitrate, greater for potassium nitrate than for ammonium nitrate, and greater for potassium chloride than for potassium nitrate. From the equation $1/c.\log C_1'/C_1 = (1-\gamma)A - \gamma B$, where A and B are constants, c and γ the molecular concentration and degree of dissociation of the electrolyte, C_1' and C_1 the molecular concentrations of the gas in salt solution and water respectively, it is possible to calculate the absorption coefficient in good agreement with experiment. On the other hand, the values of the expression $(\alpha - \alpha')/M^{2/3}$ are not satisfactorily constant, no better than those of the expression $(\alpha - \alpha')/M$.

In chloral hydrate solutions, the absorption coefficient of nitrous oxide diminishes in a linear manner with the concentration of the chloral hydrate. In propionic acid solutions, however, it actually increases with the concentration of the acid, and for the medium concentrations the values of $1/n_2.\log C_1'/C_1$ are constant (n_2 = number of molecules of acid). For nitrous oxide in solutions of sodium and potassium nitrates, the equation $1/c.\log C_1'/C_1 = (1-\gamma)A - \gamma B$ is found to be applicable. J. C. P.

Theory of the Saturation Phenomena of Binary Mixtures. P. Boedke (*Zeit. physikal. Chem.*, 1904, 48, 330—344).—A theoretical paper, in which the author, starting from the critical solution phenomena, arrives at an extension of the solution laws. In particular, it is shown that on the basis of the dilute solution laws and the law of the rectilinear diameter, it is possible to formulate the saturation relationships of certain binary liquid mixtures in good agreement with experiment (compare Rothmund, Abstr., 1898, ii, 503). J. C. P.

Lowering of Solubility. I. Hans Euler (*Arkiv. Kem. Min. Geol.*, 1904, 1, 143—158).—Attention is drawn to the parallel effects of different electrolytes, such as lithium chloride, potassium nitrate and chloride, in lowering the solubilities of hydrogen, nitrous oxide, and ethyl acetate in water. A consideration of the experimental data leads to the conclusion that the equivalent lowering of the solubility is an additive property of the two dissolved substances. It is shown that when l_0 and l are the solubilities in water and in the salt solution respectively, and c is the concentration of the salt, then $(l_0 - l)/c^{3/4} =$ const.

The author has studied also the extent to which the solubilities of two salts with a common ion are mutually affected. The pairs of salts chosen are such as crystallise without water of crystallisation.

J. C. P.

Rate of Dissolution of Salts in their Aqueous Solutions. J. Schürr (*J. Chim. phys.*, 1904, 2, 245—306).—The rate of dissolution was measured by determination of the successive times in which the crystal suspended in the liquid lost 0·01 gram in weight (apparent weight). The crystals in each case were covered with paraffin except one plane face, and the rate of dissolution was calculated as dN/dt, where N is the thickness of the crystal normally to this face. Three periods are distinguished during the dissolution: (1) preliminary period, (2) period of steady state, (3) period in which the action is irregular owing to the exaggerated deformations of the crystal face. During the first period there are formed on the face of the crystal corrosion figures; these depend on the nature of the crystal and its crystallographic face; some of these increase in size, whilst others may decrease, and after a short time they give place to what the author terms convection striæ, which appear during the second period; these striæ characterise the convection currents during the steady state; they are dependent on the position of the face in the solvent, but do not differ for the different crystallographic faces. During this period, the striæ, as also the rate of dissolution, differ but little in different crystals of the same compound. Gentle agitation of the liquid was found to have little or no effect on the dissolution. The variation of the rate of dissolution with concentration was investigated, and the results are in accord with the law that the rate of dissolution is proportional to the difference between the logarithm of the saturation concentration and of the actual concentration. This law the author further supports by theoretical considerations, but it is obviously inapplicable for the limiting case of infinite dilution. In the particular case of a very slightly soluble salt, the logarithms may be replaced by the actual concentrations, the expression $dx/dt = A\log x_0/x$ becoming $dx/dt = A(x_0 - x)$, the form of expression deduced by Noyes and Whitney. Further experiments, however, proved that this expression is not valid for more soluble salts. Experiments were then made on the rate of dissolution in solutions of other salts with one common ion. Very marked differences are found for dissolution of copper sulphate in solutions of potassium and ammonium sulphates, and the author considers that the effect of the metal is more pronounced than that of the acid radicle. In a few cases, the temperature-coefficient between 10° and 30° was obtained, and an expression of the form

$(dN/dt) = (dN/dt)(1 + at + bt^2)$ is given, where a varies from 0·03 to 0·04, and b from 0·015 to 0·02. L. M. J.

Determination of the Solubility of Salts of Weak Acids from Measurement of their Conductivity. D. Gardner and D. G. Gerassimoff (*Zeit. physikal. Chem.*, 1904, **48**, 359—364).—Kohlrausch has recently (Abstr., 1903, ii, 528) published a large number of values for the conductivity of sparingly soluble salts, these values to form a basis for the calculation of their solubility. The authors point out that if the salt is derived from a weak acid, hydrolysis, resulting in an excess of OH' ions, will take place, and thus the conductivity will not be a measure of the solubility. In the special case of barium carbonate, they show that the conductivity of the saturated solution diminishes in presence of increasing quantities of sodium hydroxide, until it reaches a limiting value about 6×10^{-6}, instead of the value $28·6 \times 10^{-6}$ obtained in pure water. It is shown, on the other hand, that the conductivity of barium sulphate, the hydrolysis of which is negligible, is scarcely affected by the presence of sodium hydroxide. J. C. P.

Solutions of Salts of Ammonia and of Amines. Hans Euler (*Arkiv. Kem. Min. Geol.*, 1904, **1**, 133—142).—The author's measurements of the solubility of aniline in water show that 100 grams of water at 18° dissolve 3·61 grams of aniline. The solubility of aniline in solutions of certain chlorides and of sodium and potassium hydroxides of various strengths was also determined. The diminutions in the solubility rest for the most part on the physical action which in general determines "salting-out" (see Abstr., 1900, ii, 196). In the case of ammonia, however, the formation of complex compounds plays a greater part. The freezing point depressions of solutions of aniline and its hydrochloride in water have been determined; when the base and the salt are both present in low concentrations, the formation of complex compounds is slight, but this becomes more marked in the more concentrated solutions.

The results show that whilst aniline forms, with metallic salts, much less stable complexes than ammonia, yet the proportion of complex salt formed is much greater with aniline than with ammonia. Analogy is drawn between compounds such as NH_4NO_3,NH_3 and $AgNO_3,2NH_3$. T. H. P.

Solubility of Calcium Sulphate in Aqueous Solutions of Potassium and Sodium Sulphates. Frank K. Cameron and J. F. Breazeale (*J. Physical Chem.*, 1904, **8**, 335—340).—The curve for the solubility of calcium sulphate in solutions of potassium sulphate, drawn with concentrations of calcium sulphate as ordinates and of potassium sulphate as abscissæ is seen to consist of two portions, one in which gypsum is the solid phase, the other in which syngenite is the solid phase. The triple point was found to correspond with the concentrations: potassium sulphate, 32·47 grams; calcium sulphate, 1·582 grams per litre. The first curve has a minimum at about the concentration potassium sulphate, 12 grams, calcium sulphate, 1·45 grams per litre (approximately); the second curve has no minimum, the concentration of the calcium sulphate decreasing from the triple point as that of the potassium sulphate increases. In solutions of sodium sulphate, a continuous curve is obtained with a minimum at about 15 per cent. of sodium sulphate. The temperature in both cases was 25°. L. M. J.

Solid Solutions between Nitro- and Nitroso-derivatives. GIUSEPPE BRUNI and A. CALLEGARI (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 567—573).—The authors have made cryoscopic measurements of: (1) nitrosobenzene in benzene and nitrobenzene; (2) *p*-nitrosotoluene in nitrobenzene and *p*-nitrotoluene; (3) ethyl *o*-nitrosobenzoate in ethyl *o*-nitrobenzoate, and (4) *o*-nitrobenzaldehyde in *o*-nitrosobenzoic acid. From the results obtained, they draw the following conclusions: (1) aromatic nitroso-derivatives in general give solid solutions with the corresponding nitro-derivatives. (2) Since the depressions are always proportional to the concentrations, and the coefficient of distribution between the two phases hence constant, the nitroso-derivatives have the simple molecular weight in such solid solutions. (3) The solid solutions, like the liquid ones, of the true nitroso-derivatives, are coloured green. (4) An acid can form solid solutions with the corresponding aldehyde. (5) It is possible to obtain solid solutions (super-saturated) in the case when the solute is not soluble in the liquid solvent.

p-Nitrosodiethylaniline forms mixed crystals with *p*-nitrodiethylaniline, and hence, in the crystalline state, has the structure of a true nitroso-derivative, although in the dissolved or molten condition it has the tautomeric quinonoid configuration. The slowness of crystallisation and the irregular cryoscopic results obtained indicate the existence, in this case, of two kinds of tautomeric molecules in the liquid phase.

The relations met with between organic nitro- and nitroso-compounds probably exist also between inorganic nitrites and nitrates (compare Müller, this vol., ii, 117). T. H. P.

Freezing of Solutions in Dimorphous Solvents. GIUSEPPE BRUNI and A. CALLEGARI (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 481—489).—Assuming that a dissolved substance does not form solid solutions with either of the two modifications of a dimorphous solvent, the authors discuss, with reference to vapour pressure-temperature diagrams, the cases of the solvent being (1) enantiotropically dimorphous and (2) monotropically dimorphous. The freezing point depression is, for case (1), greater for the stable than for the labile form; when the solution is very concentrated, the separation of the labile form may correspond with a higher freezing point than that of the stable modification. In case (2), however, the depression for the labile form is greater than for the stable one. In this way, information can be obtained regarding the character of the dimorphism of a solvent.

Knowing the freezing points of the two forms, the three transition points (T_1, T_2, and T_3), and also the cryoscopic constant (and hence the heat of fusion, Q_1), for one modification, the heat of transformation can be calculated from van't Hoff's equation: $Q_2/T_2 = Q_1/T_1 + Q_3/T_3$.

For the stable form of methylene iodide, the authors obtain the freezing point 5·7°, which agrees well with the value 5·71° obtained by Tammann and Hollmann (Tammann, *Kristallisieren und Schmelzen*, 1903, pp. 278 *et seq.*), but is considerably higher than that given by Beckmann (this vol., ii, 235), namely, 4·7°; the labile modification has the freezing point 5·23°. The heats of fusion of the two forms are 10·8° and 11·3° respectively, so that the heat of transformation is 0·5. These numbers are in accord with van't Hoff's equation.

The stable form of *o*-nitrobenzaldehyde has the freezing point 43·0°, and the molecular freezing point depression 72, the corresponding numbers for the labile modification being 40·4° and 79 respectively; this aldehyde is hence monotropically dimorphous. The same is the case for iodine monochloride. T. H. P.

Determination by an Iodometric Method of the Degree of Hydrolytic Decomposition of Salts. Wladimir E. Pawloff and D. G. Gerassimoff (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 566—572).—A preliminary paper, describing a method by which the degree of hydrolytic dissociation of salts is measured by determining the amount of iodine evolved when the salt is mixed with potassium iodide and iodate. The results obtained with a number of salts and with sulphuric acid are given in tabular form. T. H. P.

Phenomena of Flocculent Precipitation. M. Neisser and U. Friedemann (*Chem. Centr.*, 1904, i, 1387—1388; from *Münch. med. Woch.*, 51, No. 11).—The particles of mastic in an aqueous emulsion formed by pouring an alcoholic solution into water are electronegatively charged, for when subjected to a high *E.M.F.* between platinum electrodes they move to the anode and are precipitated there. The addition of small quantities of acids or salts to such an emulsion causes the particles to be precipitated in a flocculent form. Experiments have been made on the action of aluminium sulphate, ferric chloride, ferric nitrate, colloidal ferric hydroxide, arsenic trisulphide, and ferric hydroxide. The results show that when colloids and suspensions which are charged with different kinds of electricity are brought together in certain proportions, both separate in a flocculent form. Aniline dyes behave in this respect like colloids. The acid dyes which were examined were found to move towards the anode and the basic towards the cathode; the latter cause the precipitation of mastic. When arsenic trisulphide benzopurpurin, eosin, Bismarck-brown, neutral-red, methylene-blue, or positively charged colloidal ferric hydroxide is added to an excess of the negatively charged mastic, precipitation is prevented and no separation of the small quantity of colloid in a flocculent form could be detected. This inhibiting effect may be due to the coating of the one colloid or suspension by the other, whereby the former is protected from the action of the salt ions. In the zone affected, the inhibiting colloid only appears to be present, the second being in a form which cannot be detected by reactions depending on precipitation. Gelatin, serum, extract of leeches or bacteria and albuminous colloids also prevent the precipitation of negatively charged suspensions and colloids by substances by which they are not themselves precipitated. Although these colloids do not cause flocculent precipitation, they acquire this power when salts are added in quantities which are in themselves insufficient to cause precipitation. The albuminous colloids may be regarded as mixtures or as colloids which, unlike the metallic colloids, may possess both electro-positive and electro-negative properties. By the addition of small quantities of salts, the amphoteric colloids become positively or negatively charged, and then behave like the metallic colloids; a small quantity then causes flocculent precipitation of suspensions which have opposite electric charges, whilst a larger quantity prevents it. In its physical aspect, flocculent precipitation, like agglutination, appears to be a link between the phenomena of precipitation of albuminous substances and that of inorganic suspensions. E. W. W.

Experiments on the Precipitation with Colloidal Solutions of Metal Sulphides. ARTHUR MÜLLER and PAUL ARTMANN (*Chem. Centr.*, 1904, i, 1388; from *Oesterr. Chem. Zeit.*, 7, 149—151. Compare Zsigmondy, Abstr., 1902, ii, 188).—Experiments made with colloidal solutions of the sulphides of arsenic, cadmium, and silver have shown that in these cases the addition of gum and casein prevents the precipitation of the sulphides by acids or salts much more effectively than either glue or isinglass. This may depend on the fact that under certain conditions the solutions of the sulphides of arsenic and cadmium form precipitates with solutions of glue. E. W. W.

Formation of Precipitates in Gelatin. JOACHIM HAUSMANN (*Zeit. anorg. Chem.*, 1904, 40, 110—145).—A solution of a particular salt in gelatin was allowed to solidify in a small test-tube, which was then immersed in a vessel containing an aqueous solution of a second salt, which is capable of interacting with the first salt to give a precipitate. In such cases, Liesegang had previously observed that the precipitate gradually forms in the gelatin, not uniformly, but in layers; the author has examined a large number of salts to find out whether this phenomenon is a general one. The experiments were carried out at the temperature of the laboratory. The appearance of the various rings observed is represented by reproductions from photographs. In the case of silver dichromate, formed from silver nitrate and potassium dichromate, the layers were brown, and the intervening spaces became coloured with a substance lighter in colour than that of the rings, from which secondary rings gradually separated. The following precipitates were examined: silver chloride, silver bromide, silver iodide, silver thiocyanate, silver iodate, silver orthophosphate, silver pyrophosphate, lead chloride, lead iodide, lead sulphate, mercurous chloride, mercurous iodide, copper thiocyanate, copper hydroxide, lead sulphide, mercuric sulphide, silver sulphide, copper sulphide, &c. All the sulphides examined were obtained in the colloidal form in the gelatin when sodium sulphide was used as the precipitant; when, however, ammonium sulphide was used, the precipitates were more or less compact and of definite structure.

In almost all the cases examined, layers of the precipitate were formed in the gelatin; exceptions were the sulphates of barium, strontium, and calcium, the oxalates of barium and silver, and the chloride, bromide, and iodide of thallium, which formed crystals distributed throughout the gelatin.

The formation of the various precipitates in layer took place more readily in gelatin than in agar-agar or starch.

The rate at which the layers formed with various salts was studied. For equivalent dilute solutions of various chlorides, the precipitate in the gelatin (containing silver nitrate) rises to the same height in each case, whilst the rate of the action depends on the chlorion and not on the cathion with the particular chloride used. The height to which the precipitate rises is, on the other hand, dependent on the cathion of the salt dissolved in the gelatin, that is, on the silver ion, and is independent of the anion.

This method is the first one which is not electrolytic for determining the speed of ions. A. McK.

Formation and Transition of Liquid Mixed Crystals. Arnold C. de Kock (*Zeit. physikal. Chem.*, 1904, **48**, 129—176).—Solid *p*-azoxyanisole assumes the crystalline liquid condition (turbid) at 114°, and becomes a clear liquid at 135·2°. A similar substance is *p*-methoxycinnamic acid, for which the corresponding temperatures are 170·6° and 185·5°. When these two substances are mixed, the melting points (135·2° and 185·5°) are lowered; the temperature-concentration curve exhibits a rounded minimum, and shows that homogeneous liquid mixed crystals are formed in a continuous series. At certain lower temperatures, varying with the composition of the mixture, one or other of the pure solid substances is deposited, and the temperature-concentration curve based on these observations resembles an ordinary freezing point curve with a eutectic point at 107—108°. Similar experiments have been made with binary systems, only one component of which forms a crystalline liquid, namely, (1) *p*-azoxyanisole and quinol, (2) *p*-methoxycinnamic acid and quinol, (3) *p*-azoxyanisole and benzophenone, (4) ethyl *p*-azoxybenzoate and ethyl *p*-azobenzoate. In these cases also liquid mixed crystals are formed, but only up to a certain concentration of the second substance. The temperature at which *p*-azoxyanisole passes from the turbid crystalline liquid condition to the ordinary clear non-crystalline liquid condition is lowered by the addition of quinol or benzophenone. The value of the molecular depression is approximately the same (about 4900) in the two cases, provided allowance is made for the amount of quinol or benzophenone present in the mixed crystals. Using Rothmund's formula (Abstr., 1898, ii, 158), the author has calculated the latent heat of the change crystalline liquid ⟶ non-crystalline liquid for *p*-azoxyanisole, and finds the value 0·68 Cal., in good agreement with Hulett.

The manner in which in the above-mentioned liquid mixed crystals are formed, and at lower temperatures pass into ordinary crystals, gives considerable support to the view that a crystalline liquid is a homogeneous phase, and not an emulsion of two liquids. The author has repeated Tammann's sedimentation experiments (Abstr., 1902, ii, 445) with another sample of *p*-azoxyanisole, but cannot confirm that worker's observations. J. C. P.

Free Energy of Formation of some Reactions of Technical Importance. Hans von Jüptner (*Zeit. anorg. Chem.*, 1904, **40**, 61—64. Compare this vol., ii, 382).—The free energy of formation of carbon dioxide from amorphous carbon and oxygen is calculated from Le Chatelier's determinations. A. McK.

Significance of the Coefficient *B* in the Expression for the Alteration of Free Energy. Hans von Jüptner (*Zeit. anorg. Chem.*, 1904, **40**, 65—67).—The alteration of the free energy in any reaction is represented by $A_T = A_0 + BT - 2{\cdot}30259(\alpha_2 - \alpha_1)T.\log T - (\beta_2 - \beta_1)T^2 - (\gamma_2 - \gamma_1)/T^3$ (compare this vol., ii, 382). In this expression, $B = R \times$ constant, that is, the product of the gas constant R ($= 1{\cdot}982$ cal.) and another constant, deduced by integration from the van't Hoff equation,

$$dlk = -Q_T dT/RT^2, \text{ namely,}$$

$$\int Q_T dT/RT^2 + lk = \text{constant.}$$

Instances are quoted where this constant is calculated. A. McK.

Metallic Substitution. Alb. J. J. Vandevelde and C. E. Wasteels (*Bull. Acad. Roy. Belg.*, 1904, 331—360. Compare Abstr., 1903, ii, 200).—The authors have extended their investigation of the various factors which influence the velocity of reaction between metallic zinc and aqueous and dilute alcoholic solutions of copper sulphate to the effect of temperature and of the concentration of the alcohol. They find that the initial velocity of reaction, as measured by the loss of weight of the fragment of metallic zinc added, increases with rise of temperature and diminishes with increasing concentration of the alcohol. After a sufficient lapse of time, however, the velocity of reaction, measured in the same way, is greatest in the solution containing most alcohol, and the period necessary to produce this change is least at the lowest temperature employed. This abnormal behaviour is shown to be due to the fact that in the earlier stages of the reaction simple substitution of copper by zinc occurs, but that after the whole of the copper has been deposited the zinc in solution begins to be precipitated as a mixture of the basic sulphates,

$$ZnO,ZnSO_4 \text{ and } 2ZnO,ZnSO_4.$$

No precipitation of basic sulphate occurs when metallic zinc is placed in a solution of zinc sulphate.

Magnesium, on the other hand, when placed in aqueous solutions of its sulphate, furnishes basic precipitates (Lemoine, Abstr., 1899, ii, 656, and Tommasi, *ibid.*, 1900, ii, 16). The authors have repeated Kahlenberg's experiments (Abstr., 1903, ii, 426), and find that when the velocity of reaction of magnesium with water and dilute alcohol is measured by the quantity of hydrogen evolved, varying results are obtained from which no conclusion can be drawn (compare Roberts and Brown, Abstr., 1903, ii, 726). T. A. H.

Theory of Pseudo-acids. Hugo Kaufmann (*Ber.*, 1904, 37, 2468—2469. Compare this vol., ii, 326).—The author's conclusion that the salts of pseudo-acids are normally hydrolysed to the same extent as those of ordinary acids having the same dissociation constant is shown to be consistent with the results obtained by von Zawidzki (this vol., ii, 475). The objections raised by the latter author are due to a confusion between the constant K obtained by him with the true constant of hydrolytic dissociation K'. C. H. D.

Stability of Equilibrium of a Homogeneous Phase. Paul Saurel (*J. Physical Chem.*, 1904, 8, 325—334).—A mathematical paper in which results previously obtained by Gibbs are obtained by other methods. The author starts from the equation representing the energy, ϵ, of a homogeneous phase in equilibrium as a one valued function of its entropy, η, its volume, v, and the masses, m_1, m_2, &c., of its independent components, that is, $\epsilon = f(\eta, v, m_1, m_2 \ldots\ldots m_n)$. Many equations are developed, two expressing the statements:

(1) If a homogeneous phase of constant mass in stable equilibrium is heated or cooled under constant pressure or volume, the changes in temperature and in entropy have the same sign, and (2) if such a phase is compressed or expanded isothermally or adiabatically, the changes in pressure and volume have opposite signs. L. M. J.

Equilibrium Curves in the System: *p*-Bromotoluene—*p*-Dibromobenzene. W. Borodowsky and A. D. Bogojawlensky (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 559—566).—Previous work of Bogojawlensky on the specific heats of mixtures of *p*-bromotoluene and *p*-dibromobenzene having indicated a peculiarity in the melting point curves for these substances, the authors have investigated these curves. The diagram of condition for mixtures of these two compounds is formed by the superposition of two types of melting point curve: (1) a curve for isomorphous substances—mixtures of *p*-bromotoluene with *p*-dibromobenzene, and (2) a curve for substances forming a eutectic mixture—mixtures of *p*-dibromobenzene with *p*-bromotoluene. From the course taken by the melting point curve, it is evident that the mixtures represent an example of incomplete isodimorphism or one-sided miscibility of two kinds of crystals. One part of the diagram corresponds with the eutectic mixture; at 36·8°, a crystalline mixture of the composition $2C_7H_7Br,C_6H_4Br_2$ is deposited, whilst the remainder of the diagram corresponds with the formation of isomorphous mixed crystals.

The authors have also studied the boiling point curve and the curve of vapour composition for different mixtures of *p*-dibromobenzene and *p*-bromotoluene. These curves confirm the existence of this new form of equilibrium for binary crystalline mixtures. T. H. P.

Action of Bromine on Acetaldehyde in Aqueous Solution. STEFAN BUGARSZKY (*Zeit. physikal. Chem.*, 1904, 48, 63—86).—The author shows that in dilute aqueous solution the interaction of bromine and acetaldehyde is represented by the equation $C_2H_4O + Br_2 + H_2O = 2HBr + C_2H_4O_2$. The change takes place with measurable velocity, and its course may be followed by determining the unchanged bromine at intervals. That the bromine does not replace any hydrogen atoms in the aldehyde molecule is shown by the observation that the acidity of the reaction mixture (in gram-equivalents per litre) is always 1·5 times the bromine concentration (in the same unit). So long as the solution is dilute, the reaction conforms to the bimolecular type. At higher values of the bromine concentration, the simple course of the reaction is disturbed owing to the fact that the hydrogen bromide formed in the reaction fixes a certain portion of the bromine. When allowance is made for this in a manner previously adopted (Abstr., 1902, ii, 9), the bimolecular character of the reaction is again evident. When the concentration is expressed in mols. per litre, and the minute is the unit of time, the values of the velocity-coefficient, *k*, at various temperatures, *t*, are as follows:

t°.	*k*.
0	0·117
10	0·308
20	0·790
25	1·205

That is, for a rise of 10°, the velocity-coefficient increases in the ratio 2·6 : 1. Further, the variation of the velocity-coefficient with temperature is satisfactorily represented by the equation: $\log k = 0{\cdot}04068t - 0{\cdot}9257$. J. C. P.

Kinetics of Sugar Inversion. JOSEPH W. MELLOR and L. BRADSHAW (*Zeit. physikal. Chem.*, 1904, 48, 353—358).—A formula is deduced for the course of inversion of sucrose on the hypothesis that the lævulose and dextrose produced by the inversion are birotating. From this point of view, the process of inversion is a primary reaction of the first order on which two secondary reactions, also of the first order, are superposed. The formula obtained is shown to reproduce the experimental data in a satisfactory manner. A somewhat parallel case seems to be the hydrolysis of gentianose, which process, as shown by Bourquelot, takes place in two stages in presence of invertase and emulsin. J. C. P.

Enzyme Action. H. P. BARENDRECHT (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 7, 2—18).—When a given quantity of acid acts for a given time on a sugar solution, the amount of inversion is proportional to the initial concentration of the sugar. In the case of enzymes, however, the curve obtained by plotting the amount of inversion in a given time against the initial sugar concentration is not straight throughout, but after a certain value of the initial concentration becomes parallel to the horizontal axis. This peculiarity of enzyme action has originated the hypothesis on which the author works, namely, that enzymes exert their catalytic action by radiation. So long as the sugar solution is concentrated enough to absorb within a reasonable distance all radiation emanating from an enzyme particle, each particle must exert the same action. In dilute solutions, however, a part of the radiation is absorbed by the water, or when it arrives at a sugar molecule is too weakened to cause inversion. The quantity of sucrose inverted by a given amount of enzyme will, therefore, go on decreasing until a point is reached where, within the sphere of action of an enzyme particle, two sugar molecules can no longer shade each other. From this point, the inversion due to a given quantity of enzyme will be proportional to the sucrose concentration. Experiments show that the inversion of sucrose by invertase is retarded equally by dextrose, lævulose, and invert sugar, that is, these substances absorb the enzyme radiation. When allowance is made for this, it is possible to formulate accurately the course of inversion under the action of invertase.

It is to be expected that the enzyme radiation should have also a synthetical action, and the fact that it cannot ordinarily be detected is probably due in the first place to the secondary change of the decomposition products, at least in the case of invertase. It may be supposed that the reversal phenomena would be observed if the original products of inversion were unchanged, and an equilibrium would then be established. If such a large quantity of enzyme is introduced that this equilibrium point is reached before the birotatory glucose has been converted to any great extent into ordinary glucose, the curve indicating the process of inversion will alter its course at that point, and thereafter the formation of fresh α-glucose will be dominated by the velocity of the conversion of the total α-glucose present into β-glucose. Those equilibria phenomena are observed more readily in the inversion of maltose by yeast extract. J. C. P.

The Reaction induced by an Indirectly Oxidising Ferment (Peroxydase). ÉMILE BOURQUELOT and L. MARCHADIER (*Compt. rend.*, 1904, **138**, 1432—1434).—The authors find that the action of a peroxydase in the presence of hydrogen peroxide on vanillin is the same as that of an oxydase in the presence of air; the peroxydase employed was that present in macerated oatmeal, and the product obtained was dehydrodivanillin (compare Lerat, this vol., i, 360), identified by means of its melting point and dimethyl derivative. In this reaction, the hydrogen peroxide cannot be replaced by manganese dioxide. The oxydase and peroxydase further resemble one another in their action in that they are not affected by the presence of a large proportion (50 per cent.) of alcohol, they are paralysed by the presence of a small proportion of hydrocyanic acid, and they resist the action of heat for a longer period of time than the hydrolytic ferments. In explanation of these facts, the authors refer to the hypothesis of the mixed nature of the peroxydases (compare Chodat and Bach, Abstr., 1903, i, 378), and suggest that the peroxydase contains (1) a *hydroxydase* capable, in the presence of air, of converting water into hydrogen peroxide, or giving peroxides with certain substances, and (2) an indirect oxydase capable of decomposing the peroxides with production of active oxygen. M. A. W.

New Conception of the Chemical Atom. P. DE HEEN (*Bull. Acad. Roy. Belg.*, 1904, 285—289).—The atom is defined as the constant quantity of energy which a given volume of an elementary substance in the gaseous state possesses under the same conditions. If this energy be taken as unity, then the atomic weights are the relative weights of the elements which contain this constant quantity of energy. Physically, an atom may be regarded as composed of rotating fibres of infinite length, in number at least equivalent to the lines in the spectrum of the element, and each having a definite energy of rotation and exercising for equal lengths the same pressure.

Combination between molecular proportions of two monatomic univalent gases would imply that the gyrostats of fibres would join two by two, and the volume of the product would be one-half that of the total volume of the two reacting gases. Since two welded gyrostats would transform the same amount of energy of rotation into energy of translation as a single gyrostat, the same conception may be extended to combination between diatomic and polyatomic gases. Here it may be supposed that the two gyrostats (represented graphically in the original by a disjointed circle of arrows) become iodynamic by some external influence, and the electrons liberated from each gyrostat form an intermediate chain, which exerts a tension and eventually brings the two gyrostats into the tangential position.

It follows from this view that the reactivity of a substance will depend on the facility with which it becomes iodynamic, that if the orientation of its electrons corresponds with that of the cathode rays, the substance will be electro-negative, and if the orientation is converse, electro-positive, and that the maximum valency of a substance will depend on the number of electrons present in each atom. The application of this idea becomes simpler if it is supposed that all gases under the same conditions possess the same length of fibre, that is, have the same number of molecules, and that each atom consists of a single infinitely long, unique, gyrating fibre having distributed about its axis as many twists of different diameters and tensions as there are lines in the spectrum of the element. A molecule in the same way may be regarded as a compound fibre or cable composed of atomic gyrostats, some of which may be left and others right. In the solid form of a compound, the cable is rolled on itself and the nature of its optical activity will depend on the direction in which the cable is coiled. T. A. H.

International Atomic Weights. JOJI SAKURAI and KIKUNAYE IKEDA (*Chem. News*, 1904, 89, 305).—A letter sent by the authors, as representing the Tokio Chemical Society, to Prof. F. W. Clarke, Chairman of the International Sub-committee, protesting against the introduction of the hydrogen standard in the recent tables of atomic weights, notwithstanding that the larger Committee, from which the sub-Committee was formed, decided to use exclusively the weights based on the oxygen standard. J. C. P.

Limits of Sensitiveness of Odours and Emanations. MARCELLIN BERTHELOT (*Compt. rend.*, 1904, 138, 1249—1251. Compare Abstr., 1901, ii, 406).—The odour of iodoform is perceptible when 1 gram of the substance loses one-billionth of a gram in an hour. In a hundred years, the loss of weight from 1 gram under the author's conditions of experiment would be less than 1 milligram. In the case of musk, the loss of weight associated with the perception of the odour is possibly a thousand times smaller. On the basis of these data, the author considers it unreasonable to infer that a chemical element has been decomposed because certain very sensitive properties (such as the spectroscopic lines), peculiar to a second element, make their appearance. Minute traces of the second element in the substance examined are more likely to be the cause of the phenomenon. H. M. D.

A Mechanical Model to Illustrate the Gas Laws. FRANK B. KENRICK (*J. Physical Chem.*, 1904, 8, 351—356).—The author, considering that there is great difficulty in getting elementary students to grasp the ideas of the gas laws, Carnot's cycle, the entropy function, &c., has devised a mechanical model, by which these relationships may be illustrated. The model, which is described with the aid of a diagram, has been in use in his laboratory, and an example of a problem worked out with it is given. L. M. J.

Apparatus for Removing Volatile Matters by a Current of Steam. M. EMMANUEL POZZI-ESCOT (*Ann. Chim. anal.*, 1904, 9, 209—210).—A tubular flask has near the top of its neck a side-tube (which can be attached to a condenser), whilst lower down a tube reaching to the bottom of the flask is attached internally. The liquid from which volatile matter is to be removed is placed in the flask, which is then, by means of a split cork, placed between the two tubes, fixed in the neck of a balloon, the lower part of the flask being immersed in the water, or other liquid in the balloon. On heating the liquid in the balloon to ebullition, the vapour passes down the internal tube, through the contents of the flask, and escapes through the upper side-tube. L. DE K.

Extraction Apparatus and Condensers. HERBERT E. DURHAM (*Proc. physiol. Soc.*, 1904, xxvii—xxxi; *J. Physiol.*, 31).—A simplification of apparatus for extraction. The principle of the condenser used is that the cooling apparatus is placed internally. The apparatus is fully explained with diagrams. W. D. H.

Reflux Condenser with Outer and Inner Cooling Arrangement. ANTON LANDSIEDL (*Chem. Zeit.*, 1904, 28, 598).—A description of a new form of reflux condenser in which the water passes first through a coil of glass tubing placed within the condenser tube and then through the usual outer jacket. A. McK.

New Laboratory Apparatus. ULRICH (*Chem. Zeit.*, 1904, 28, 598).—The author has devised a new Allihn condenser, wholly made of glass and consisting of an outer jacket, a condensing tube, and a second refrigerating tube sealed to the condensing tube. The inner tube is connected with the outer one in such a manner that the water may pass from the outer tube through the inner one, so causing a double refrigeration.

A convenient gas-generating apparatus is described, which dispenses with the usual drying or absorbing tubes. The instrument, which takes up little room, consists of a generating vessel with two drying or absorption apparatus vertically placed on it, the whole forming a single apparatus. L. DE K.

An Improved Portable Gas Generator. HERBERT McCOY (*Ber.*, 1904, 37, 2534—2536).—A modification of Ostwald's generator, which has the advantage of being portable. For details, the original should be consulted. W. A. D.

New Form of U-Tube. ROMUALD NOWICKI (*Chem. Zeit.*, 1904, 28, 622).—The U-tube described, it is claimed, has advantages not possessed by the ordinary type. A. McK.

A New Apparatus for Washing and Absorbing Gases. OTTO SCHEUER (*Chem. Zeit.*, 1904, 28, 598—599).—A single tube is so bent that the gas passes in a fine stream of bubbles through three or more layers of the absorbing liquid. Stoppers are provided, so that the liquid in each section can be independently added or removed by means of a pipette. A. McK.

Form of Absorption Apparatus. ROMUALD NOWICKI (*Chem. Zeit.*, 1904, 28, 644).—A description of a convenient form of gas absorption apparatus, which consists essentially of two similar upright absorption vessels. The entering tube reaches nearly to the bottom of the vessel, and is at the end drawn out to a fine orifice. This end enters into the lower opening of a coil of glass tubing standing vertically in the absorbing liquid. The stream of gas acts in the coil like an injector, causing a steady current of the absorbing liquid. The exit tube from the first cylinder is connected to the entering tube of the second. The cylinders are filled with the same or different absorbents as needed. A. McK.

A New Form of Pipette. CARL MEYER (*Zeit. öffentl. Chem.*, 1904, 10, 227).—A graduated pipette has a narrow tube passing down its centre. The lower end of the tube is tapered, so as to close the outlet of the pipette. The top of the tube is closed, and an india-rubber band at the top of the pipette holds the two together. The pipette is widened into a bulb just above the graduated portion, and a side-tube leads from the bulb. The pipette is filled by aspirating with the mouth at the side-tube. The solution passes up the inner tube, and then through a small hole in the latter placed at the zero point of the pipette. When filled, any excess of solution above the zero point runs back through the inner tube. To empty the pipette, either completely or partially, the inner tube is slightly raised. W. P. S.

Inorganic Chemistry.

Atomic Weight of Iodine. Paul Köthner and E. Aeuer (*Ber.*, 1904, 37, 2536—2538).—Silver iodide, purified by Stas' treatment, gave by Ladenburg's method (Abstr., 1902, ii, 314, 498) an atomic weight 125·89 for iodine (H = 1); when the same silver iodide is further purified by Ladenburg's method, the value for the atomic weight as a mean of eight determinations becomes 125·984, a value much nearer that obtained by Ladenburg (126·008) than to Stas' value (125·90). The treatment of the iodide with ammonia thus effects a real purification. The author has also prepared hydrogen iodide from carefully purified ethyl iodide, which, on account of the great difference in the boiling points of the ethyl haloids should be free from chlorine or bromine; the value for the atomic weight of iodine obtained by converting the hydriodic acid into silver iodide was found to be 126·026. Finally, the combustion of silver in a current of iodine gave a value for iodine 126·011 (H = 1). W. A. D.

Autoxidation of Sulphur. August Harpf (*Zeit. anorg. Chem.*, 1904, 39, 387—388).—Finely-divided sulphur suffers a slight oxidation on exposure to sunlight for several days in an exsiccator containing sodium hydroxide. The autoxidation of sulphur also takes place in the dark and increases with elevation of temperature. The assumption made by Windisch and others that the disinfecting property of sulphur on the moulds, formed during the growth of grapes, is due to the formation of sulphur dioxide, produced by the action on the sulphur of active oxygen and hydrogen peroxide generated by the living plants, is thus unnecessary. A. McK.

Electrochemical Preparation of Salts of Hyposulphurous Acid. Karl Elbs and K. Becker (*Zeit. Elektrochem.*, 1904, 10, 361—364).—Sodium hydrogen sulphite solution is electrolysed with a porous diaphragm and a cathode of platinum, aluminium, or zinc. At first, sodium hyposulphite is formed at the cathode in almost theoretical quantity, but the yield very soon falls off owing to the further reduction of the hyposulphite to thiosulphate, $Na_2S_2O_4 + 2H = H_2O + Na_2S_2O_3$. It was impossible to prepare solid sodium hyposulphite in this way. When solutions of calcium or magnesium hydrogen sulphite in water or dilute alcohol are electrolysed in the same way, a little hyposulphite is formed in solution, but the solid substance which separates out is the neutral sulphite of calcium or magnesium. Zinc hydrogen sulphite gave similar results. From a concentrated solution of sodium and zinc hydrogen sulphites, however, a solid substance is deposited, about one-quarter of which consists of sodium hyposulphite. Solutions of sodium magnesium and of sodium manganese hydrogen sulphites gave no solid substance. T. E.

Atomic Weight of Nitrogen; Analysis by Weighing Nitrogen Monoxide. Philippe A. Guye and Stefan Bogdan (*Compt. rend.*, 1904, **138**, 1494—1496).—The discrepancy between the values for the atomic weight of nitrogen as determined by Stas (14·04 to 14·05 according to the method of calculation), and deduced from physico-chemical methods by Guye (14·004; compare this vol., ii, 392, 475), has led the authors to make a new determination of the value, using a direct method. The method consisted in decomposing a known weight of nitrogen monoxide by means of a spiral of iron wire raised to incandescence by an electric current; the difference between the weight of the wire before and after the experiment gave the weight of the oxygen contained in the known weight of nitrogen monoxide, from which the atomic weight of nitrogen in the system $O=16$ was obtained. The mean of six determinations was 14·007, with an upper and lower limit of 14·023 and 13·992 respectively. The authors do not consider the result conclusive, but the close approximation of this value to the one deduced from physico-chemical methods justifies in their opinion a revision of the value $N=14·04$ adopted by the International Commission for Atomic Weights in the table for 1904. M. A. W.

Determination of the Atomic Weight of Nitrogen by the Volumetric Analysis of Nitrogen Monoxide. Adrien Jaquerod and Stefan Bogdan (*Compt. rend.*, 1904, **139**, 49—51. Compare preceding abstract).—The authors have determined the atomic weight of nitrogen by a volumetric method which consists in decomposing nitrogen monoxide in a constant volume apparatus by means of a spiral of iron wire heated to redness by an electric current; owing to a difference in the compressibility of the two gases, an additional pressure of about 5 mm. is necessary to bring the residual nitrogen to the same volume as the original nitrogen monoxide. Knowing this increase of pressure, the initial pressure, and the densities of nitrogen monoxide and of nitrogen, the atomic weight of nitrogen can be calculated from the ratio N_2/N_2O.

The nitrogen monoxide was prepared by the action of sodium nitrite on hydroxylamine sulphate, the measurements made at 0° and the pressures approximating to 760 mm. were read to 1/100 mm.; using the values obtained by Rayleigh and Leduc for the weight of a normal litre of nitrogen and of nitrogen monoxide, the atomic weight of nitrogen deduced from these experiments is 14·019 $(O=16)$.

M. A. W.

Solubility of Nitrogen in Liquid Oxygen. Ernst Erdmann and Fred Bedford (*Ber.*, 1904, **37**, 2545—2550. Compare this vol., ii, 328).—A reply to Stock's criticisms (this vol., ii, 396). It is shown experimentally that when nitrogen gas is passed into pure liquid oxygen the boiling point of the latter is lowered to a much greater extent than when gaseous oxygen is passed into the same liquid; the lowering of the boiling point is continuous to a certain extent, thus, after two minutes, it is 0·99, after 5 minutes 1·26, and after 12 minutes 1·94. When gaseous hydrogen is passed instead of nitrogen, the fall in boiling point is greater (2·9°), and takes place suddenly. After passing nitrogen gas, the residual liquid is no longer pure oxygen, but contains from 2 to 10 per cent. of nitrogen, showing that liquid oxygen at its boiling point absorbs nitrogen. W. A. D.

Hydronitric Acid [Azoimide] and the Inorganic Trinitrides.

Louis M. Dennis and A. W. Browne (*J. Amer. Chem. Soc.*, 1904, 26, 577—612).—A *résumé* is given of previous work on azoimide and the inorganic trinitrides (azoimides).

The azoimide used in the present investigation was prepared by a modification of Wislicenus' method (Abstr., 1892, 1151), which depends on the action of nitrous oxide on heated sodamide. The process was carefully studied and is described in detail.

Lithium and barium azoimides crystallise from aqueous solutions with $1H_2O$, but when these salts are left over sulphuric acid in a desiccator they gradually become anhydrous. Silver azoimide is soluble in boiling water to the extent of about 0·1 gram per litre.

It has been shown by Curtius and Darapsky (Abstr., 1900, ii, 474) that when sodium azoimide is treated with solution of iron alum or ferric chloride, a deep red coloration is produced. This test is found to be very delicate and of general application to the inorganic trinitrides. The colour is discharged by the addition of dilute hydrochloric acid, whilst the colour of ferric thiocyanate is not affected by this reagent. Mercuric chloride, however, discharges the colour of ferric thiocyanate more readily than it does that of ferric azoimide. By means of these reactions, trinitrides and thiocyanates may be detected in presence of each other.

The estimation of azoimide cannot be satisfactorily effected by titration with potassium permanganate in presence of sulphuric acid, since the reaction takes place very slowly towards the end, and it is therefore impossible to secure a definite end-point, and also because the substances tend to react in somewhat different proportions under varying conditions. The reaction probably takes place in accordance with the following equation:

$$2KMnO_4 + 6N_3H + 3H_2SO_4 = K_2SO_4 + 2MnSO_4 + 6H_2O + 9N_2 + O_2.$$

E. G.

Properties of Mixtures of Nitric and Sulphuric Acids. II.

A. V. Saposchnikoff (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 518—532. Compare Abstr., 1904, ii, 251).—Analysis of the vapour obtained from all mixtures of nitric and sulphuric acids containing from 100 to 30 per cent. of nitric acid shows that it consists of the pure monohydrate, HNO_3; with less nitric acid in the mixture, the vapour contains a larger proportion of nitrogen than the monohydrate, owing to the formation of nitrogen pentoxide by dehydration. The action of sulphuric acid on nitric acid containing water is hence to absorb the water and concentrate the nitric acid, thus rendering the nitrating action of the mixture more vigorous. The composition of the mixture possessing the highest vapour pressure is almost exactly expressed by: $5HNO_3 + 2H_2SO_4 + 3H_2O$. T. H. P.

Acid Nitrates. Erich Groschuff (*Zeit. anorg. Chem.*, 1904, **40**, 1—23).—Ammonium trinitrate, $NH_4NO_3,2HNO_3$, prepared by dissolving ammonium nitrate in nitric acid of sp. gr. 1·514 at 20° and then allowing the solution to crystallise at 0°, separates in needles or prisms and melts at 29—30°, whilst Ditte gives 18°. It is a stable salt, differing from the labile *ammonium dinitrate*, NH_4NO_3,HNO_3, prepared by dissolving ammonium nitrate (1 mol.) in nitric acid (1 mol.), cooling the mixture first quickly to 10°, and then to a temperature not exceeding 6°; when the separation of the salt begins, the temperature rises to its melting point, namely, 11·5°. A stable eutectic mixture of trinitrate and normal salt (m. p. 16°) of almost the same composition as the dinitrate may also be formed. The solubility of ammonium nitrate in nitric acid was determined. The dinitrate is decomposed by water, but the trinitrate is not.

Potassium trinitrate, $KNO_3,2HNO_3$, melts at 22° and not at $-3°$, as quoted by Ditte; it crystallises in prisms. *Potassium dinitrate*, KNO_3,HNO_3, is stable only between 21—22° (its eutectic point with the trinitrate) and 28—29° (the transition temperature into the normal salt); it crystallises in leaflets. The trinitrate forms with normal potassium nitrate a eutectic mixture which melts at 21°.

The ammonium nitrates described, with the exception of the trinitrate, are more soluble in nitric acid than are the corresponding potassium salts. The saturated solutions of the two trinitrates and ammonium dinitrate are richer in nitric acid than are the corresponding solid phases.

The dinitrates are decomposed by water. Potassium trinitrate first dissolves without decomposition at temperatures between $-1°$ and 22°, then normal salt separates. The solubility of potassium mononitrate in water first falls on the addition of nitric acid and then rises.

A. McK.

Action of Gaseous Ammonia on Arsenic Trichloride, Tribromide, or Tri-iodide. Charles Hugot (*Compt. rend.*, 1904, **139**, 54—56).—By the action of ammonia on arsenic trichloride, tribromide, or tri-iodide at $-30°$ to $-40°$ in a special apparatus previously described (compare Abstr., 1901, ii, 18), *arsenamide* is formed together with ammonium chloride, bromide, or iodide according to the equation $AsCl_3 + 6NH_3 = As(NH_2)_3 + 3NH_4Cl$. Arsenamide is a greyish-white, amorphous powder, insoluble in liquid ammonia, stable below 0° when out of contact with moist air, and at the ordinary temperature in an atmosphere of ammonia; it is decomposed by water to form arsenious oxide and ammonia, and at temperatures above 0° decomposes slowly into *arsenamide* according to the equation $2As(NH_2)_3 = As_2(NH)_3 + 3NH_3$; the decomposition is complete at 60°, and the imide is a stable, yellow, amorphous compound, which is not decomposed when heated at 100° in a vacuum and is less readily decomposed by water than the amide; when heated at 250°, however, it loses ammonia and is converted into *arsenic nitride*, $As_2(NH)_3 = 2AsN + NH_3$, which is an orange-red solid decomposing into arsenic and nitrogen at a temperature not far removed from its point of formation.

M. A. W.

Non-existence of Arsenic Pentachloride. Warren Rufus Smith and Joseph E. Hora (*J. Amer. Chem. Soc.*, 1904, 26, 632—635).—By the action of chlorine on arsenic trichloride at – 34°, Baskerville and Bennett (Abstr., 1903, ii, 208) obtained a substance which they assumed to be arsenic pentachloride.

It has been found that the freezing point of a solution of chlorine in arsenic trichloride in which As : Cl = 1 : 3 is – 16·2° and that the freezing point falls regularly as the proportion of chlorine increases, that of a solution in which As : Cl = 1 : 9 being – 59·5°. When a solution containing molecular proportions of chlorine and arsenic trichloride is cooled, solid begins to separate at – 48°, but the substance does not solidify completely, some liquid still remaining at – 70°. The solid substance which separates seems in every case to be arsenic trichloride; it is therefore concluded that arsenic pentachloride is not formed under these conditions, and that the product described by Baskerville and Bennett was merely a solution of chlorine in arsenic trichloride. E. G.

Solubility of Silicon in Silver. A Crystalline Variety of Silicon Soluble in Hydrofluoric Acid. Henri Moissan and F. Siemens (*Compt. rend.*, 1904, 138, 1299—1303).—Silicon is much more readily soluble in silver than in either lead or zinc (compare this vol., ii, 332), 100 parts of silver dissolving 9·22 parts at 970°, 14·89 at 1150°, 19·26 at 1250°, and 41·46 at 1470°. The silicon recovered from the solution is a mixture of ordinary crystalline silicon and a new allotropic crystalline form which is soluble in hydrofluoric acid and has a sp. gr. of 2·42 in benzene. The yield of the new allotropic modification appears to be independent of the temperature at which the solution has been effected and of the velocity of cooling, but decreases as the amount of silicon in the original solution increases, being 58·02, 27·60, 19·00, and 16·00 per cent. respectively in the four mixtures given above, and 99 per cent. in a 2 per cent. solution of silicon in silver. The new variety is unchanged by heating at 1200° in hydrogen or nitrogen, and contains only slight traces of iron and silicon carbide as impurities. M. A. W.

Coagulation of Colloidal Silver. A. W. Dumansky (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 465—468).—As regards their action on colloidal solutions of silver prepared by Carey Lea's method, metallic salts may be divided into two groups: (1) salts of oxides of metals of which sub-oxides also exist, such as mercuric chloride, cupric chloride, ferric chloride, &c.; these change into salts of the sub-oxides. (2) This comprises salts of oxides to which no sub-oxides correspond and also salts of sub-oxides. Such salts either reduce the silver to metal or coagulate it, losing part of their acid, or do not undergo change, but precipitate the silver, as happens with salts of ferrous oxide.

T. H. P.

Reactivity of Calcium Sulphate in Colloidal Media. Paul Rohland (*Zeit. anorg. Chem.*, 1904, 40, 182—184).—The hardening of calcium sulphate is possibly due to the formation of a dilute, solid solution of the water (of crystallisation, constitution, or dilution) with the calcium sulphate. A. McK.

Formation of Oceanic Salt Deposits. XXXVII. Potassium Pentacalcium Sulphate and a Double Compound analogous to Kaliborite. Jacobus H. van't Hoff [in part with Geiger and Lichtenstein] (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 28, 935—937).—*Potassium pentacalcium sulphate*, $K_2Ca_5(SO_4)_6$, prepared by heating precipitated gypsum for from one to three days with a 5 per cent. solution of potassium sulphate until microscopic examination shows that all the gypsum has been converted into the double salt, is distinct from syngenite, $CaK_2(SO_4)_2,H_2O$, and from Ditte's double salt,

$$Ca_2K_2(SO_4)_3,3H_2O.$$

The ratio between the number of molecules of potassium sulphate and 1000 molecules of water was determined at 83° for saturated solutions of (*a*) potassium sulphate, (*b*) potassium sulphate and syngenite, (*c*) syngenite and potassium pentacalcium sulphate, and (*d*) potassium pentacalcium sulphate and anhydrite respectively. For the preparation of potassium pentacalcium sulphate at 83°, a solution of potassium sulphate, containing 5·6 molecules to 1000 molecules of water, is most suitable.

The preparation of *potassium magnesium borate*,

$$2K_2O,2MgO,11B_2O_3,20H_2O,$$

from pinnoite, potassium chloride, and boric acid, is also described.

A. McK.

Decomposition of Mixtures of Calcium Carbonate and an Alkali Carbonate under the Action of Heat in a Vacuum. Paul Lebeau (*Compt. rend.*, 1904, 138, 1496—1498. Compare Abstr., 1903, ii, 477; this vol., ii, 121).—The experiments described in this paper were undertaken with the object of studying the action of the alkali oxides on calcium oxide at a high temperature. Preliminary experiments (compare this vol., ii, 121) having shown that the alkali carbonates are readily dissociated into carbon dioxide and the alkali oxide at a high temperature and under reduced pressure, molecular mixtures of calcium carbonate and an alkali carbonate (cæsium, rubidium, sodium, or potassium) were heated in a vacuum; decomposition was complete at about 1000°, carbon dioxide equivalent to the carbonate taken was evolved, and the residue consisted of pure lime in the form of transparent skeleton crystals, prismatic in the case of the mixtures containing cæsium and rubidium and lamellar in the case of the mixtures containing sodium or potassium; these crystalline fragments are without action on polarised light, and resemble the crystalline or fused lime obtained by Moissan in being much less readily attacked by reagents than ordinary lime; for example, they retain their transparency in water, and only become superficially hydrated after prolonged contact.

The dissociation of the mixed carbonates proceeds much less readily than that of calcium carbonate alone, and the dissociation pressure is always lower than that of pure calcium carbonate and higher than that of the pure alkali carbonate for the same temperature; thus the decomposition of the mixture containing cæsium carbonate began at 540°, and at 1020° the dissociation pressure was 490 mm.; that of pure calcium carbonate would be greater than one atmosphere. These facts point to the existence of double carbonates of calcium and the alkali metal possessing different dissociation pressures.

M. A. W.

Electrolytic Preparation of Magnesium and Zinc Peroxides.

FRIEDRICH HINZ (D.R.-P. 151129).—Preparations of magnesium and zinc peroxides, obtained by chemical means, contain a considerable proportion of lower oxides. Better products are obtained by electrolysing solutions of zinc or magnesium chloride in vessels having a porous diaphragm, hydrogen peroxide being added to the solution in the cathode-cell. Platinum or carbon anodes and platinum or tin cathodes are employed. The concentrated solution of the metallic salt is first neutralised by adding the corresponding oxide and then electrolysed, magnesium requiring a potential difference of 6—7 volts and zinc 2·5—3 volts. The precipitated hydrated peroxides are collected and dried, special precautions being taken to avoid decomposition. The reaction takes place according to the equation $Mg + H_2O_2 + 2H_2O = Mg(OH)_4$. The magnesium peroxide obtained contains 40—50 per cent. of MgO_2, and the zinc peroxide 55—60 per cent. of ZnO_2, the theoretical values being 60 and 73 per cent. respectively.

C. H. D.

Preparation and Electrolysis of Pure Molten Zinc Chloride.

SIEGFRIED GRÜNAUER (*Zeit. anorg. Chem.*, 1904, 39, 389—476).—When commercial zinc chloride is heated until the evolution of steam is no longer perceptible and then electrolysed, either in a crucible over a free flame or in a U-tube, hydrogen is evolved at the cathode, the amount of hydrogen gradually diminishing until finally only zinc separates. As various specimens of commercial zinc chloride exhibit different behaviour on being electrolysed, the author has studied the conditions for the preparation of pure zinc chloride. The experimental conditions under which the various specimens of zinc chloride were electrolysed are very fully described. Those specimens which were readily electrolysed were found to contain ammonium chloride, and the influence of ammonium chloride on specimens of zinc chloride, which suffered electrolysis with difficulty, was accordingly investigated. In none of the latter cases did the separation of zinc take place at once. Experiments were next conducted with mixtures of zinc chloride and ammonium chloride in varying proportions, the mixtures having been dehydrated at 260° as far as possible. Another set of experiments is described where the mixtures were dehydrated with dry hydrogen chloride. With increasing amounts of ammonium chloride, the electrolysis proceeds with less ease; the molten masses remain free from zinc dust, but the preliminary evolution of gas at the cathode persists for a long time. The most favourable result was obtained with a mixture in the proportion of 11 mols. of zinc chloride to 1 mol. of ammonium chloride. The gases evolved at the anode were chlorine, hydrogen chloride, oxygen (resulting from the moisture still retained by the fused ammonium chloride), carbon monoxide or carbon dioxide (resulting from the oxidation of the carbon poles), and nitrogen (resulting from the oxidation of ammonium chloride by chlorine), whilst hydrogen, ammonia, and nitrogen were evolved at the cathode. The amounts of these gases were determined by gasometric methods.

Anhydrous zinc chloride is prepared by heating ordinary zinc chloride, which has been dehydrated as far as possible, with concentrated hydrochloric acid. It may also be prepared by passing dry chlorine into fused zinc or by adding zinc to molten lead chloride. An apparatus is described by means of which zinc chloride was dehydrated by a stream of hydrogen chloride.

The electrolysis of pure zinc chloride was next studied under varying conditions of current strength. A description of the separation of iron and zinc by the fractional electrolysis of their fused chlorides is given. Mixtures of zinc chloride with potassium and sodium chlorides respectively were also electrolysed with varying current strengths. The metallic cloud, which separates during the electrolysis of zinc chloride at the initial stage, has a lustre like that of mercury. A. McK.

Metallic Hydroxides. I. H. W. Fischer (*Zeit. anorg. Chem.*, 1904, 40, 39—53).—The solubility of copper hydroxide in sodium hydroxide solution falls as the latter becomes more dilute. When copper nitrate was used instead of copper sulphate in the preparation of copper hydroxide, the solubility of the latter in sodium hydroxide did not increase. The influence of sodium and potassium carbonates respectively on the solubility of copper hydroxide in sodium hydroxide is slight.

The solubility of chromium hydroxide in an aqueous solution of red chromic chloride is not directly proportional to the concentration of the latter. A basic chloride is probably formed. From a solution of chromium hydroxide in aqueous chromic chloride, the former cannot be precipitated either by the addition of electrolytes or by the action of heat; part of it is supposed to be in solution in the colloidal form and part in the form of a compound containing chlorine.

Determinations of the solubility of aluminium hydroxide in aluminium chloride solution show that a portion of the former goes into solution to form a compound, whilst part is in the colloidal form. The colloidal portion existing in such solutions was precipitated by barium sulphate, and the concentration of the hydrogen ions before and after the addition of barium sulphate was determined by the methyl acetate method. A. McK.

Basic Mercury Salts. Alvin J. Cox (*Zeit. anorg. Chem.*, 1904, 40, 146—181).—The hydrolysis of the mercury salts, $HgCrO_4$, $Hg(NO_3)_2$, $HgSO_4$, $HgNO_3$, Hg_2SO_3, causes the formation, first of all, of basic salts and then of the oxide. Mercuric fluoride, HgF_2, is hydrolysed directly to mercuric oxide and hydrogen fluoride. The basic salts obtained were $3HgO,CrO_3$; $3HgO,N_2O_5$; $3HgO,SO_3$; $5Hg_2O,3N_2O_5,2H_2O$; $2Hg_2O,SO_3,H_2O$. In accordance with the Phase Rule, the single salts require a minimum concentration of the hydrolytically dissociated acid, the determination of which renders the preparation of the pure basic salts possible. The basic salts quoted are intermediate between normal salts and oxides; other basic salts, quoted in the literature, are simply mixtures of two individuals in undefined proportions.

The hydrolysis of mercuric salts is considerably greater than that of mercurous salts, which also accords with the difference in electro-affinity of the two cathions. The hydrolysis of mercurous nitrate is more complicated than that of mercuric nitrate. A. McK.

Bismuth-aluminium and Magnesium-aluminium Alloys. HECTOR PÉCHEUX (*Compt. rend.*, 1904, 138, 1501—1503. Compare this vol., ii, 404).—I. *Bismuth-aluminium* alloys. Attempts to prepare alloys containing less than 70 per cent. of aluminium were unsuccessful, the ingot consisting of three layers, the lower one being heterogeneous and containing bismuth in excess, the middle one being an alloy containing about 70 per cent. of aluminium, whilst the upper one was a homogeneous alloy containing about 90 per cent. of aluminium. Alloys containing 75, 85, 88, and 94 per cent. of aluminium with the sp. gr. of 2·857, 2·79, 2·776, and 2·74 at 20° respectively have melting points intermediate between those of the two component metals; they are sonorous, brittle, and have a beautiful silvery-white colour. They are stable in dry or moist air, readily attacked by concentrated or dilute acids, hot or cold, and by potassium hydroxide in the cold, and decompose distilled water at 18° or 95° into hydrogen and oxygen (compare this vol., ii, 487), the bismuth becoming slightly oxidised; this reaction is probably due to a thermochemical action induced by the unequal heating of the two metals in the process of filing.

II. Magnesium-aluminium alloys. Alloys containing 66, 68, 73, 77, and 85 per cent. of aluminium with the sp. gr. of 2·244, 2·275, 2·324, 2·373, and 2·474 at 21° respectively have melting points not far removed from that of aluminium, are brittle, have a beautiful silvery-white colour, and are capable of taking a good polish. They are stable in the air at the ordinary temperature, but burn readily at a red heat, are readily attacked by concentrated or dilute acids, hot or cold, with the exception of the alloys containing 85, 77, and 73 per cent. of aluminium, which are not attacked by dilute sulphuric acid, and are readily attacked by potassium hydroxide solution in the cold. Hydrogen peroxide is decomposed by these alloys, the magnesium suffering oxidation, and they decompose water. M. A. W.

Aluminium Chlorate: its Hydrates and its Decomposition on Heating. DMITRI K. DOBROSERDOFF (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 468—483).—Aluminium chlorate, prepared by the interaction of barium chlorate and aluminium sulphate, is deposited from its solutions, on evaporation over sulphuric acid, in the form of the two hydrates, $Al(ClO_3)_3,9H_2O$ (in the cold) and $Al(ClO_3)_3,6H_2O$ (when hot). These hydrates correspond with Flavitsky's theoretical chemical types of a monohydro-ortho-acid, $RH(OH)_6 = RHO_3,3H_2O$, and its first anhydride. The salt cannot be obtained in the anhydrous state owing to its ready decomposability.

Aluminium chlorate undergoes decomposition in two ways: (1) on being slowly and cautiously heated (at 100°), it explodes, owing to the evolution of chlorine dioxide, which detonates, and (2) when rapidly and energetically heated, it does not explode, but evolves chlorine, the basic chlorate, $Al_2(ClO_4)_6,Al_2O_3$, being probably left in the residue. T. H. P.

A Basic Ferric Phosphite. E. Berger (*Compt. rend.*, 1904, **138**, 1500—1501).—The white substance obtained by Grützner (compare Abstr., 1898, ii, 216) by dissolving recently precipitated ferric hydroxide in phosphorus acid and precipitating with excess of water has a variable composition intermediate between that of an acid and a neutral phosphite; if, however, the precipitate is washed with cold water to remove all traces of free phosphorus acid and then dried, the resulting white powder has a constant composition, and is found to be a *basic ferric phosphite*, $Fe_4(HPO_3)_6,Fe(OH)_3,5H_2O$. M. A. W.

Separation of Nickel and Cobalt. Hans Albert Frasch (D.R.-P. 151955. Compare this vol., ii, 128).—Nickel and cobalt may be separated by precipitating a strongly ammoniacal solution of their salts by means of an alkali chloride, filtering off the precipitate, and washing with water. Nickel ammonio-chloride passes into solution, cobalt ammonio-chloride is decomposed according to the equation: $Co(NH_3)_2Cl_2,4NH_3 + 2H_2O = Co(OH)_2 + 2NH_4Cl + 4NH_3$. For electrolytic purposes, the cobalt hydroxide thus obtained may be dissolved in ammonia, reprecipitated by alkali chloride, and again dissolved in ammonia. C. H. D.

Certain Compounds of Chromium. George O. Higley (*J. Amer. Chem. Soc.*, 1904, **26**, 613—632).—When platinic chloride is added to a solution of green chromic chloride, $CrCl_3,6H_2O$, and the product is slowly evaporated in a desiccator, the *compound*

$$CrCl_3,PtCl_4,10H_2O$$

separates in thin, rhombic plates. On treating a solution of this salt with silver nitrate, silver platinichloride is precipitated together with a trace of silver chloride. From further experiments, it was concluded that the platinum compound is a derivative of a hypothetical chromic chloride, $[CrCl(H_2O)_5]Cl_2$, with doubled water molecules in the complex and its formula is $\{CrCl[(H_2O)_2]_5\}PtCl_6$.

When violet chromium chloride, $[Cr(H_2O)_6]Cl_3$, is heated at 65—70°, it is gradually converted into the ordinary green salt. Various attempts were made to prepare the green chloride described by Peligot (*Compt. rend.*, 1844, **19**, 738) in which two-thirds of the chlorine is immediately precipitated in the cold by solution of a silver salt, but without success.

The green chloride, $CrCl_2[(H_2O)_2]_4(H_2O)_2Cl$, dissolves in water without development or absorption of heat. The heat of solution of the ordinary green chloride, $[CrCl_2(H_2O)_4]Cl(H_2O)_2$, was found by Recoura to be $-0·04$ K. It is evident, therefore, that the doubling of the water molecules of the complex has only a slight effect on the heat of solution. The heat of solution of the chloride, $[CrCl_2(H_2O)_4]Cl$, is

83·96 K; this value therefore represents the amount of heat developed on the addition of 2 gram-mols. of water to 1 gram-mol. of the green salt containing $4H_2O$.

Methods are described for the preparation of violet chromic sulphate and violet chromic iodide. The latter salt forms deep violet crystals, but, when powdered, is of an olive-green colour; it appears to contain three doubled water molecules in its complex, and is represented by the formula $\{Cr[(H_2O)_2]_3\}I_3$.

Zinc chromium fluoride, $[Zn(H_2O)_6](CrF_5,H_2O)$, and *copper chromium fluoride*, $[Cr(H_2O)F_5][Cu(H_2O)_4]$, were prepared and analysed.

By dissolving freshly precipitated chromic hydroxide in glacial acetic acid, Recoura obtained a salt to which he assigned the formula $Cr(H_2O)_5(C_2H_3O_2)_3$. It is considered probable that this substance was not the normal salt, since it was amorphous and contained only 5 mols. instead of 6 mols. H_2O. An attempt to prepare a crystalline normal salt was made by evaporating the solution at 0°, when a small quantity of bluish-violet crystals was obtained. Analysis of this substance indicated that it contained 6 mols. H_2O, but the salt had evidently lost acetic acid, and the result was therefore inconclusive. Further attempts were made to prepare this salt in quantity, but without success. E. G.

Reactions of Uranous and Manganous Salts. William Œchsner de Coninck (*Bull. Acad. Roy. Belg.*, 1904, 360—362).—When nitric acid is added to hot aqueous solutions of uranous or manganous sulphates, alone or in presence of sulphuric acid, no evolution of nitric oxide occurs. A neutral aqueous solution of manganous chloride behaves similarly with nitric acid, but in presence of sulphuric acid the liquid becomes brown and there is a rapid evolution of chlorine and nitrous vapours. It is suggested that the momentary darkening of the liquid may be due to the formation of manganese tetrachloride. T. A. H.

Uranium Oxides and Carbonate. William Œchsner de Coninck (*Bull. Acad. Roy. Belg.*, 1904, 363—365 and 448—449. Compare Abstr., 1901, ii, 165).—It is suggested that the red oxide of uranium already described has the formula $(UO_3)_2$, and is a polymeride of the orange-coloured oxide. The polymeride combines with acetic acid, so that cryoscopic measurements in this solvent gave no definite results.

When green uranium oxide is dissolved in sulphuric or hydrochloric acid and to the liquid, previously diluted with three times its volume of water, a strong aqueous solution of methylamine is added, a brown, flocculent precipitate is formed, which is readily soluble in dilute acids. When washed with water during a day and then warmed in water for several hours, it becomes pulverulent, very dense, and difficultly soluble in acids, and cryoscopic measurements indicate that it has undergone polymerisation.

When aqueous solutions of potassium carbonate and uranium nitrate are mixed, the yellow precipitate obtained appears to consist of a mixture of uranium carbonate with potassium uranyl carbonate.

On ignition, it furnishes potassium uranate and the hydrated oxide, UO_3,H_2O. When the precipitate is washed with water, it is converted into a mixture of uranium carbonate and uranic oxides, and the wash-water on evaporation leaves a residue containing the hydrated oxide, UO_3,H_2O, and potassium uranyl carbonate, but no potassium uranate.

T. A. H.

Influence of Pressure on the Melting Point of Tin and of Bismuth. GUSTAV TAMMANN (*Zeit. anorg. Chem.*, 1904, 40, 54—60).—The influence of pressure on the melting point of tin and of bismuth was studied. The metal was fused in an electric oven and the curve of cooling determined at different pressures by means of a thermo-element. Increase of pressure raises the melting point in the case of tin, and lowers it in the case of bismuth. In the apparatus described, temperatures up to 400° and pressures up to 3000 kilos. per square cm. could be registered. With bismuth, the change of the temperature of the melting point is represented by $\Delta t = -0{\cdot}00386\ (p-1)$, and with tin by $\Delta t = +0{\cdot}00216\ (p-1)$, where p = pressure in kilos. per square cm.

A. McK.

Physico-chemical Researches on Tin. V. ERNST COHEN (*Zeit. physikal. Chem.*, 1904, 48, 243—245. Compare Abstr., 1900, ii, 83, 212, 408; 1901, ii, 106, 244).—A remarkable case of tin corrosion at Ohlau (Schlesien) is recorded and illustrated by photographs.

J. C. P.

Stannichlorides of the Types M_2SnCl_6 and $M''SnCl_6$. I. EUGEN VON BIRON (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 489—518).—The author has prepared and analysed a number of stannichlorides, of which Rb_2SnCl_6, $ZnSnCl_6,6H_2O$, $FeSnCl_6,6H_2O$, and $SrSnCl_6,4H_2O$ have not been previously described. The compound of Li_2SnCl_6 with $8H_2O$ (Chassevant, *Ann. Chim. Phys.*, 1893, [vi], 30, 124) could not be obtained, but only the hexa-hydrated salt. No double compounds of stannic chloride with $BaCl_2$, $CdCl_2$, $CuCl_2$, $AgCl$, $PbCl_2$, or $TlCl$ could be prepared.

The stannichlorides are completely analogous to the platinichlorides. Calcium stannichloride and platinichloride occupy intermediate positions between the corresponding salts of the metals of the magnesium group (Mg, Zn, Cd, Mn, Fe, Co, Ni, and Cu) and those of the glucinum group (Gl, Sr, Ba).

Chlorostannic acid is considerably less stable than chloroplatinic acid, and the same holds for the corresponding complexes of the stannichlorides and platinichlorides.

On investigating the equilibrium between $CoCl_2,6H_2O$, $CoSnCl_6,6H_2O$, and $SnCl_4,5H_2O$ and their solutions, it was found that at 20° $CoSnCl_6,6H_2O$ separates without admixture of its components from solutions containing not less than 1·9 and not more than 5·5 mols. of $SnCl_4$ per mol. of $CoCl_2$.

Wells' classification of double salts (Abstr., 1902, ii, 11) does not apply to the stannichlorides, since such compounds of metals which are very similar in all their properties (K, Na, and Li; Co and Ni) are found to belong to different groups, according to this classification. Whether a double salt belongs to one or another of Wells' groups depends not only on the degree of dissociation of the salt in solution, but also on the relative solubilities of the salt and its components.

T. H. P.

Basic Zirconium Sulphate. Otto Hauser (*Ber.*, 1904, 37, 2024—2026).—No sparingly soluble crystalline compound of zirconium has yet been described, and this has greatly retarded the work of separating purified derivatives of the element. A systematic investigation of the basic salts has shown that the *basic sulphate*, $4ZrO_2,3SO_3,14H_2O$, satisfies the required conditions. T. M. L.

Formation of Vanadium Ores in Nature. Alfred Ditte (*Compt. rend.*, 1904, 138, 1303—1308).—Vanadium is widely though sparsely diffused throughout the earth's crust; water charged with atmospheric gases is capable of absorbing the vanadium, probably in the form of vanadic acid or soluble alkali vanadates; these waters, coming in contact with the natural ores of lead, galena, anglesite or cerusite, exert a solvent action on them, and form lead vanadate, which is the chief natural source of the element.

Experiments on the action of solutions of alkali vanadates on lead sulphate, either solid or in dilute aqueous solution, show that an equilibrium mixture of lead vanadate and the alkali sulphate is formed, but when, as in nature, the latter is removed, the transformation of the lead sulphate to the vanadate is almost complete.

M. A. W.

Allotropic Forms of Antimony Sulphide. Heats of Formation. Joseph Guinchant and Paul Chrétien (*Compt. rend.*, 1904, 139, 51—54).—When antimony sulphide is heated in a current of nitrogen at about 850° and the vapours rapidly condensed, a mixed sublimate is formed consisting of a lilac-coloured deposit of transparent, spherical globules and of black needles, quite different from the allotropic form obtained by Rose and by Fuchs (*Ann. Phys. Chem.*, 1834, 31, 578) under similar conditions. The red precipitated sulphide and the lilac allotropic modification are readily converted into the black sulphide, by heating either alone at 220° or with dilute hydrochloric acid at 100°, and the specific gravities at 0° of the three modifications are as follows: red precipitated sulphide, 4·120; lilac sublimate, 4·278; fused black precipitated sulphide, 4·652; synthetical black sulphide, 4·659. Using the value, 34 Cal., determined by Berthelot (Abstr., 1886, 308, 512) for the heat of formation of the moist precipitated sulphide, the heats of formation of the various forms have been determined from their heats of solution in sodium sulphide solution, with the following results: for the dried precipitate, 32·6 Cal., for the lilac sublimate, 33·9 Cal., and for the black sulphide 38·2 Cal. M. A. W.

Mixtures of Certain Sulphides and Selenides with Corresponding Metals. Henri Pélabon (*J. Chim. Phys.*, 1904, ii, 321—339).—By means of a thermo-electric couple, the melting point curve was traced for mixtures of bismuth or antimony with sulphur or selenium. In the case of mixtures of bismuth and sulphur containing less sulphur than the amount corresponding with BiS, the initial point of solidification varied with composition; the final was the melting point of bismuth. The curves also indicate clearly the existence of BiS and show that the compound forms a homogeneous liquid with excess of bismuth. Similar results were obtained with bismuth and selenium. Mixtures of antimony and sulphur containing antimony in excess separate, however, into two layers, the upper a solution of antimony in its sulphide, the lower a solution of the sulphide in antimony, unless the proportion of sulphur is below 1·5 per cent., when the sulphide is completely dissolved in the metallic antimony. Selenium and antimony do not, however, form two layers. The melting point curves are given in the two cases. L. M. J.

Bismuth Tetroxide Otto Hauser and Ludwig Vanino (*Zeit. anorg. Chem.*, 1904, 39, 381—386).—Whilst bismuth trioxide yields a mixture of tetroxide and pentoxide on oxidation with potassium hydroxide and chlorine, it yields the tetroxide only when alkaline potassium ferricyanide is used as the oxidising agent; the action is practically quantitative when bismuth trioxide (1 mol.) is boiled with potassium ferricyanide (2 mols.) in potassium hydroxide solution. The oxide, when dried at 100°, contains $1H_2O$, and, when dried at the ordinary temperature, $2H_2O$; it becomes anhydrous at 160—170°. The oxide has acid characters; when heated with potassium hydroxide solution, it turns brown and appears to form a potassium salt, from which the free hydroxide may be regenerated by the addition of dilute nitric acid. No hydrogen dioxide is formed on the addition of concentrated sulphuric acid. A. McK.

Chemical Effects of Light. Action of Hydrochloric Acid on Platinum and Gold. Marcellin Berthelot (*Compt. rend.*, 1904, 138, 1297—1299).—When pure gold or platinum foil immersed in fuming hydrochloric acid, of sp. gr. 1·178 (36 per cent.), in flasks containing air, is exposed to the action of light for four months, the metal slowly dissolves, forming the chloride, and the rate of solution is increased by the addition of a trace of manganous chloride to the solution (compare Abstr., 1890, 6). If, however, the experiment is conducted in the dark, the metal is not attacked by the acid. The action of the light appears to facilitate the fixation of free oxygen, which displaces the chlorine from the hydrogen chloride.

M. A. W.

Platinum-ammonium Compounds. Hans Euler and Astrid Euler (*Ber.*, 1904, 37, 2391—2395).—When recrystallised from water, Grimm's red salt (*Annalen*, 1856, 99, 95) yields *chloroplatinodiammine chloride*, $Pt(NH_3)_4Cl_4$, which crystallises in reddish-yellow scales or as a yellow powder. It loses 2Cl on treatment with silver nitrate, and is reduced to platodiammine chloride by hydrogen sulphide. With sulphuric acid, the chloride yields *chloroplatinodiammine sulphate*, which crystallises in flat, red needles, becomes white and opaque on contact with water, and regains its red colour on addition of hot concentrated sulphuric acid. The action of ammonia on chloroplatinous acid leads to the formation of diplatosemidiammine chloride, $Pt_2(NH_3)_4Cl_2$, and platosemidiammine chloride, $Pt(NH_3)_2Cl_2$. The filtrate from these gives a precipitate of slender, white needles (hydroxychloroplatinodiammine chloride ?) on addition of platodiammine chloride.

When recrystallised from water, the diacid sulphate of Reiset's base, $Pt(NH_3)_4(HSO_4)_2$, yields another sulphate,

$$3Pt(NH_3)_4SO_4,H_2SO_4,H_2O,$$

which crystallises in prisms and loses H_2O at 100°. In solution, the free base has the constitution $Pt(NH_8)_2(NH_3{\cdot}OH)_2$. G. Y.

Mineralogical Chemistry.

"Silajit," an Ancient Eastern Medicine. DAVID HOOPER (*J. Asiatic Soc. Bengal*, 1903, 72, 99—104).—The name "silajit" (meaning rock-sweat) is applied to a variety of substances used as drugs, which occur as exudations upon rocks in the mountainous districts of northern India. One variety consists of aluminium sulphate, another ("white silajit") of dried urine of the wild hill-goat, and a third ("black silajit") consists of an organic acid combined with alkalis. The last-named variety is almost wholly soluble in water, and has the following composition :

	Water.	Organic matter.	Ash.	Total.	Nitrogen in organic matter.
I.	9·85	56·20	34·95	100·00	1·03
II.	15·90	49·86	34·24	100·00	0·82
III.	11·15	51·55	37·30	100·00	3·25
IV.	10·99	56·86	32·15	100·00	1·26

The ash has the composition :

	Fe_2O_3,Al_2O_3.	CaO.	MgO.	K_2O.	Na_2O.	P_2O_5.	SO_3.	Cl.	CO_2, &c.	SiO_2.
I.	2·24	4·36	1·50	9·07	4·11	0·16	0·58	0·07	11·51	1·35
II.	1·08	3·96	0·52	6·69	7·63	0·25	0·24	0·12	12·13	1·62
III.	6·00	3·86	0·15	3·71	1·07	0·27	0·34	0·11	3·69	18·10
IV.	4·64	3·88	1·34	6·10	0·81	0·20	0·14	0·06	4·82	10·15

L. J. S.

Identity of Mamanite with Polyhalite. JACOBUS H. VAN'T HOFF and GERARDUS L. VOERMAN (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 984—986).—Attempts to produce mamanite,

$$Ca_3K_2Mg_2(SO_4)_6,3H_2O,$$

artificially being unsuccessful, its existence as a mineral species appeared doubtful. The following new analysis of a carefully selected portion of the original material, from Maman in Persia, proves the identity of mamanite with polyhalite, ($Ca_2K_2Mg(SO_4)_4,2H_2O$).

Ca.	K.	Mg.	SO_4	H_2O.	Total.
14·1	13·1	4·2	61·6	6·4	99·4

L. J. S.

Melanterite [and Alunogen] from Baluchistan. David Hooper (*J. Asiatic Soc. Bengal,* 1903, 72, 236—239).—At several localities in Baluchistan there is mined a mineral called "khaghal," which is used for dyeing; it occurs as a white efflorescence on decomposed slate. Analysis of the portions (about 40 per cent.) soluble in water gave the results under I (for material from Ladon Pass) and II (from Kil Chotok):

	$FeSO_4$.	$Al_2(SO_4)_3$.	$CaSO_4$.	$MgSO_4$.	K_2SO_4.	Na_2SO_4.	Total.
I.	30·10	4·50	3·12	1·20	0·74	2·06	41·72
II.	27·36	4·02	3·78	1·50	0·27	2·86	39·79

Another mineral, known as "phulmâk" and used in Baluchistan as a mordant in dyeing, occurs as white, granular or silky masses; analysis of the portion soluble in water proves it to be alunogen, ($Al_2(SO_4)_3,18H_2O$). L. J. S.

Crystallised Rhodonite from S. Marcel (Valle d'Aosta). Luigi Colomba (*Atti R. Accad. Torino,* 1904, 39, 664—668).—The author has obtained rhodonite in drusy masses of dark red crystals having the composition:

SiO_2.	MnO.	CaO.	Total.
46·71	47·73	5·41	99·85

corresponding with the formula $7MnSiO_3,CaSiO_3$. The crystals are very rich in forms, some of which have not been observed previously.

T. H. P.

Thuringite and Chamosite from Thuringia. Edward Robins Zalinski (*Jahrb. Min.,* 1904, *Beil.-Bd.,* 19, 40—84).—A detailed account is given of the thuringite and chamosite from the deposits of iron-ore in the Lower Silurian of Thuringia. Analyses I and II of thuringite agree with the accepted formula $H_{18}(Fe,Mg)_8(Al,Fe)_8Si_6O_{41}$. Analyses III and IV of chamosite (impure owing to admixed carbonates) give the formula $H_{18}(Fe,Mg)_9Al_6Si_6O_{39}$.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	H_2O.	CO_2.	Total.
I.	22·30	16·81	15·13	32·78	1·30	—	11·04	—	99·36
II.	21·35	17·70	11·57	36·81	3·90	—	8·78	—	100·11
III.	23·54	18·15	3·67	36·84	1·35	1·62	11·58	not det.	96·75
IV.	23·39	18·64	6·06	34·34	1·44	1·55	11·01	not det.	96·43

L. J. S.

Refraction of Tourmaline. Charles Soret (*Arch. Sci. phys. nat.*, 1904, [iv], 17, 573—588).—The paper contains the measurements of the indices of refraction, for ordinary and extraordinary rays, of a number of samples of tourmaline. The death of the author has unfortunately interrupted the work, and prevented the formulation of conclusions which he considered justified. L. M. J.

[Toke-uchi-mura and Weaver Mtn.] Meteorites. Carl Klein (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 978—983).—Analyses, by Lindner, are given of: I, the meteoric stone of Toke-uchi-mura, Yofu-gori, Tamba, Japan, and II, the compact meteoric iron of Weaver Mountain, near Wickenburg, Arizona.

	SiO_2.	MgO.	FeO.	CaO.	MnO.	K_2O.	Na_2O.	Fe_2O_3.	Cr_2O_3.	NiO.
I.	36·34	20·91	14·76	2·47	0·15	0·28	1·18	0·36	0·42	0·30

	Fe.	Ni.	Co.	S.	P.	$FeCr_2O_4$.	Insol.	Total.	Sp. gr.
I.	16·58	1·82	0·05	2·75	0·08	0·95	—	99·40	3·815
II.	80·78	17·92	0·84	0·15	0·12	—	0·15	99·96	7·108

L. J. S.

Iodo-saline Water of Castel S. Pietro dell' Emilia. Felice Garelli and Felice Gorni (*Chem. Centr.*, 1904, i, 1423—1424; from *Boll. Chim. Farm.*, 43, 233—239. Compare Vitali, *ibid.*, 39, 732).—The iodo-saline water of Castel S. Pietro dell' Emilia was found to have a sp. gr. 1·0112 at 4°. The yellow, flocculent precipitate which was formed when the water remained for a long time, contained iron, aluminium, silicon, calcium, carbon dioxide, and traces of magnesium and manganese. A litre of water contained 0·8610 gram $NaHCO_3$, 0·1233 $Ca(HCO_3)_2$, 0·1113 $Mg(HCO_3)_2$, 0·0101 $Fe(HCO_3)_2$, 0·0660 $CaSO_4$, 0·1151 $CaCl_2$, 0·9057 $MgCl_2$, 0·0347 $MgBr_2$, 0·0316 MgI_2, 0·3647 KCl, 15·5999 NaCl, 0·1648 Al_2O_3, 0·0122 SiO_2, and small traces of manganese, ammonia, and phosphates. The residue obtained by evaporating a litre of water and heating at 180° weighed 18·2575 grams, but after heating to a red heat, only 17·5800. E. W. W.

Physiological Chemistry.

Fertilisation, Artificial Parthenogenesis, and Cytolysis in the Sea Urchin. Jacques Loeb (*Pflüger's Archiv*, 1904, 103, 257—265. Compare Abstr., 1902, ii, 707).—A further contribution to a subject on which the author has already written much. The results form an extension of the views previously expressed. W. D. H.

Mechanism of Oxygen Supply to the Body. Adolf Loewy and Nathan Zuntz (*Chem. Centr.*, 1904, i, 1452—1453; from *Arch. Anat. Physiol., physiol. Abth.*, 1904, 166—216).—The tension of dissociation of oxyhæmoglobin is dependent on the method adopted to prepare it; if alcohol is used, it is smaller than when the use of that reagent is avoided; laking the blood also lowers the tension. Figures are given to illustrate these facts. The resistance of the alveolar wall to gases was investigated in the frog's lung, the gas used being carbon dioxide. The influence of certain reagents on the process is given, and the results stated per square centimetre of lung surface; the entry of oxygen from the alveoli to the blood and from the blood to the tissues occurs easily at low pressures, and there is no need to postulate agencies at work other than physical. W. D. H.

Action of Strychnine on the Respiratory Centre. H. Biberfeld (*Pflüger's Archiv*, 1904, 103, 266—275).—After morphine has been administered and respiration thus slowed, intravenous injection of strychnine in rabbits produces an increase in rate and depth of respiration; the same (but more especially in the depth of respiration) occurs also when both vagus nerves are divided high in the neck. The effect of strychnine on the respiration of normal animals is very slight. W. D. H.

Diurnal Variations in Blood Corpuscles. Herbert C. Ward (*Amer. J. Physiol.*, 1904, 11, 394—403).—In the morning, the red corpuscles are relatively high in number; this declines in the afternoon, and rises again next morning. The hæmoglobin follows the same course. Mealtimes and occupation seem to be the principal factors concerned. The leucocytes vary also, and approximately in the opposite direction; details concerning the different kinds of leucocytes are given. W. D. H.

Proteolytic Ferment in Leucæmic Blood. Franz Erben (*Beitr. chem. Physiol. Path.*, 1904, 5, 461—462).—Schumm doubts whether the presence of a proteolytic ferment in leucæmic blood is the explanation of the occurrence of proteolytic products there. Since then the author has prepared from such blood, extracts which contain both a tryptic and a peptic enzyme; the latter is present in small amount only. W. D. H.

Resistance of Proteid to Tryptic Digestion in the Animal Organism. Siegfried Rosenberg and Carl Oppenheimer (*Beitr. chem. Physiol. Path.*, 1904, 5, 412—421).—The resistance of unaltered horse serum to tryptic digestion has been previously described. The same holds true for other "genuine" proteids in experiments *in vitro*, and also *in vivo* if the material is injected into the intestine 30 centimetres below the pylorus in the dog, that is, below the situation of Brunner's glands. The absorption of fat is also small. W. D. H.

Inhibition of Pepsin Activity by Salts. Julius Schütz (*Beitr. chem. Physiol. Path.*, 1904, 5, 406—411).—Anions act inhibitingly on pepsin within much wider limits than cathions; this corresponds with Pauli's results on the precipitation of proteids by salts, but the analogy otherwise breaks down. Of the cathions, sodium is the most powerful in its inhibiting action; the action is wholly additive or nearly so. The influence of the electric charge on inhibition is small.

W. D. H.

Composition of Pancreatic Juice. LUCIAN A. E. DE ZILWA (*J. Physiol.*, 1904, 31, 230—233).—The alkalinity of secretin juice is usually greater than that of pilocarpine juice. Alkalinity diminishes as secretion progresses, but it can be maintained by injecting sodium carbonate into the blood. Pilocarpine juice contains about four times as much solid material as secretin juice. The solids diminish as secretion progresses. The variations in the solids are almost entirely due to variations in the amount of proteids. The mineral matter is fairly constant, about one-quarter of it consisting of chlorides. Of the proteids, nearly three-quarters are coagulated by a temperature under 55°; most of the remainder came down under 75°. There is no appreciable difference between the freezing points of serum and pancreatic juice. There is a larger quantity of nucleoproteid in pilocarpine juice than in secretin juice, probably from a toxic effect of the alkaloid on the cell substance. W. D. H.

Relation of Autolysis to Proteid Metabolism. H. GIDEON WELLS (*Amer. J. Physiol.*, 1904, 11, 352—354).—Autolysis, so far as nitrogenous substances are concerned, was investigated in the liver; addition of extracts of thyroid, kidney, and spleen do not influence it. There is no effect such as Cohnheim found in glycolysis in muscle with the addition of pancreatic extract. W. D. H.

Autolysis of Tissues. JANET E. LANE-CLAYPON and SAMUEL B. SCHRYVER (*J. Physiol.*, 1904, 31, 169—187).—The experiments conducted on intestinal mucous membrane, liver, and kidney show that a great degradation of tissues occurs after death; the nitrogenous extractives increase in all cases, and in that of the liver amount to more than 50 per cent. of the total during the first 24 hours after incubation. Three stages are distinguished: (1) one of small change, (2) rapid degradation, and (3) gradual autolysis represented on the tracings by a straight line. This is not influenced by perfusion or ammonium oxalate, and is the same whether carried out in saline solution or distilled water. It is therefore regarded as a chemical function of cell-protoplasm. The second stage is quicker in a fasting than in a well-fed animal. The organs of the fasting animal appear to contain more enzyme (or zymogen) set free automatically and acting as a protection against starvation. W. D. H.

Autolysis of Testis and Spleen. PHOEBUS A. LEVENE (*Amer. J. Physiol.*, 1904, 11, 437—447).—All the glands so far studied form, on prolonged self-digestion, similar end-products, but there is a marked difference in their proportions. In testis and spleen, autolysis occurs best in weakly acid solutions; acetic acid was employed. In the case of the testis, tyrosine, various amino-acids, pyrrolidine-2-carboxylic acid (in small amount), aspartic and glutamic acids, and purine bases were identified; pyrimidine and hexone bases could not be identified with certainty. In the case of the spleen, only the amino-acids were studied. W. D. H.

Uptake of Water and Salt by the Epidermis and the Hygroscopic Characters of Certain Horny Structures. Wilhelm Filehne and H. Biberfeld (*Beitr. chem. Physiol. Path.*, 1904, 5, 449—460).—An investigation of the passage of lanolin mixed with water and salts into epidermal structures. Lanolin itself is not hygroscopic, and the uptake of water and salt by the human epidermis is very small and is not increased by the presence of lanolin. The amount absorbed varies in different individuals, and is with weak solutions relatively greater than with strong solutions of salt.
W. D. H.

Feeding with Cholic Acid in Cystinuria. Charles E. Simon and D. G. Campbell (*Beitr. chem. Physiol. Path.*, 1904, 5, 401—405).—The amount of neutral and oxidised sulphur in the urine varies considerably. On "normal" days, the neutral sulphur varies from 16 to 61 per cent. of the total, and averages 34 per cent. On days on which cholic acid was given, the average percentage was 24·8. It is regarded as doubtful if this really implies lessening of the cystin excreted. Various other possibilities are discussed. W. D. H.

Utilisation of Vegetable Proteid by the Animal Organism. Elbert W. Rockwood (*Amer. J. Physiol.*, 1904, 11, 355—369).—Vegetable proteid, as judged by the nitrogen in the fæces, is less utilised than animal proteid. This is apparently due to admixture with other substances, for in experiments with the separated proteid from oats, no such disadvantage occurred. Cooking produced no marked difference. The experiments were made on dogs and men.
W. D. H.

Formation of Sugar from Proteid and Fat in the Animal Body. Eduard Pflüger (*Pflüger's Archiv*, 1904, 103, 1—66).—Polemical against Lüthje (*Münch. med. Woch.*, 1902, 1601). Doubt is cast on his results and conclusions, namely, whether the animals used were completely carbohydrate free, whether pancreatic extirpation really produces diabetes, and whether in the organism glycogen is formed from proteid and from fat. W. D. H.

Formation and Elimination of Urea in Man. Henri Labbé and Morchoisne (*Compt. rend.*, 1904, 138, 1636—1639).—The amount of urea excreted varies with the amount of nitrogen in the food, and is less when vegetable food is taken. W. D. H.

Muscular Contraction and Energy. Auguste Chauveau (*Compt. rend.*, 1904, 138, 1465—1470).—By means of a new apparatus, the conditions of muscular work in man can be accurately gauged under varying conditions. During work, the amount of oxygen absorbed is roughly proportional to the work done; by working slowly, for instance, two contractions instead of thirteen per minute, the actual values of the oxygen absorbed are reduced. The respiratory quotient always rises. Two kinds of contraction are studied, namely, *static*, in which the weight is not actually raised, but the muscles of the forearm work against a measured resistance, and *dynamic*, in which the weight is raised. W. D. H.

Intraorganic Combustion. J. Tissot (*Compt. rend.*, 1904, 138, 1545—1547).—From experiments on the dog, the following conclusions are drawn: a considerable diminution of oxygen-tension in the air produces a lessening of oxygen in the blood, even although an increase of pulmonary ventilation takes place. But this is not accompanied by any modification in the intensity of the respiratory exchanges. Intraorganic combustion is therefore independent of the amount of oxygen in the arterial blood. W. D. H.

Action of Oxygen on Frog's Nerves. K. H. Baas (*Pflüger's Archiv*, 1904, 103, 276—281).—Experiments are described which confirm Baeyer's results (*Zeit. allgemein. Physiol.*, 2, 169) that oxygen is necessary for the continued activity of excised frog's nerves. The normal nerve is considered to participate in respiratory metabolism. W. D. H.

Glycogen in Organs. Hermann Loeschcke (*Pflüger's Archiv*, 1904, 102, 592—631).—The research shows that glycogen is not chemically bound in the liver and other tissues where it occurs, as Nerking considered. It is possible to extract it all by the prolonged use of hot water. What difficulty there is in extraction is also found in artificial mixtures of glycogen and albumin. By extraction with dilute alkali hydroxide, there is usually loss of glycogen if the process is prolonged; a part of the glycogen is converted into substances soluble in alcohol. W. D. H.

Secretion of Acid by the Kidney. Arthur R. Cushny (*J. Physiol.*, 1904, 31, 188—203).—The acidity of urine in diuresis varies within strict limits. It is never alkaline to phenolphthalein nor acid to methyl-orange, and thus corresponds with the interval in reaction between mono- and di-sodium phosphate. The intravenous injection of most saline diuretics is followed by a marked fall in the percentage acidity, partly because the phosphates are deficient, and partly because absorption in the tubules is lessened. Phosphates injected in the same way increase urinary acidity, especially if the absorption in the tubules is increased. This is explained by the dissociation of the phosphates of the glomerular fluid, which permits of absorption of the cathion along with hydroxyl or carbonate anions. These can permeate the epithelium, while the phosphate anion fails to do so freely, and so remains in the tubules along with the hydrogen cathions replacing the original ones. The essential factors in the secretion of acid urine are (1) the presence of salts in the glomerular fluid which are capable of extensive hydrolysis, and of which the cathions can permeate the epithelium, while the anion fails to do so equally readily; and (2) sufficient absorption in the renal tubules. Phosphates fulfil these conditions. Carbonates fail to do so because the anion is absorbed, and the borates satisfy the conditions only in relation to phenolphthalein, because the anion is too weak to compete with the stronger anions of litmus. W. D. H.

Urinary Chromogen due to Subcutaneous Injection of Scatole. CH. PORCHER and CH. HERVIEUX (*Compt. rend.*, 1904, 138, 1725—1727).—On a rigid milk diet, indole derivatives disappear from the urine. If scatole is then injected, a chromogen appears in the urine, which is not a derivative of indole, but no statement can as yet be made as to its composition. W. D. H.

Sensibility to Carbon Dioxide diminished by Barometric Depression. ANGELO MOSSO (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 591—597).—Experiments on rabbits and monkeys show that in a rarefied atmosphere containing a constant proportion of carbon dioxide, the exciting action of the latter is diminished, and, further, that by depressing the force of the respiratory movements below the normal value, the rarefaction causes a slight paralysis of the nervous centres regulating the respiration. T. H. P.

Inhibitory Influence of Potassium on the Heart. E. G. MARTIN (*Amer. J. Physiol.*, 1904, 11, 370—393).—Inhibition produced by vagus stimulation and by potassium on the heart of the terrapin are very similar. The analogy does not hold in every detail, but explanations are given to account for the differences. W. D. H.

Physiological Effects of Radium. C. J. SALOMONSEN and G. DREYER (*Compt. rend.*, 1904, 138, 1543—1545).—Exposure of animalcules to the radium emanations causes their death in time; amœbæ are more resistant than *Nassula*; before death, their movements become lessened, multiplication is inhibited, and cyst formation prevented. Trypanosomes are readily killed; mammalian blood is hæmolysed. W. D. H.

Action of Adrenaline. T. R. ELLIOTT (*Proc. physiol. Soc.*, 1904, xx—xxi; *J. Physiol.*, 31).—Further experiments to show that the effect of adrenaline on plain muscle is the same as that produced by exciting sympathetic nerves. In an animal dying after excision of the suprarenals, the plain muscle has not only lost tone, but may even fail to respond to excitation of the sympathetic nerves, although sensory and motor nerves to voluntary muscle are still efficient. The sympathetic ganglia and the suprarenal medulla have a common embryological origin; perhaps the presence of adrenaline is necessary, and this substance may be secreted by sympathetic ganglia. But adrenaline does not excite the ganglia as nicotine does when applied to them locally; its effective action is localised at the periphery. Nevertheless, after complete denervation, the plain muscle of the dilator pupillæ responds to adrenaline, in fact more readily than in the intact iris. Adrenaline, therefore, cannot excite any structure derived from or dependent for its persistence on the peripheral neuron. On the other hand, it evokes no reaction in muscle which has never been innervated by the sympathetic (Brodie and Dixon); the chemical excitant, adrenaline, which is liberated on each occasion when the impulse arrives at the periphery, must act on some mechanism developed out of the muscle-cell in response to its union with the synapsing sympathetic fibre, the function of which is to receive and transform the nervous impulse. W. D. H.

Action of Eserine and Atropine on the Denervated Sphincter Iridis. Hugh K. Anderson (*Proc. physiol. Soc.*, 1904, xxii—xxiv; *J. Physiol.*, 31).—A certain time after the nerves of the iris have been cut, eserine causes once more a contraction of the sphincter. This is overcome by atropine. The reappearance of contraction disappears when the nerves are once more cut, and is therefore due not to independent excitability of the muscle itself, but to regeneration of nerve fibres, although other evidence of restoration of function (response to light or to direct stimulation of the nerves) is absent. W. D. H.

Hay-fever. R. Ashleigh Glegg (*J. Hygiene*, 1904, **4**, 369—406).—The pollen which excites this disease owes its toxicity to an albuminous substance. As little as 0·000025 mg. will cause conjunctivitis in a person predisposed to the disease. The active proteid is an albumin: it is mixed with an inactive globulin. Injection of larger doses causes serious symptoms. An antitoxin has been prepared and gives excellent results. W. D. H.

Application of the Laws of Chemical Equilibrium to Mixtures of Toxins and Antitoxins. Walther Nernst (*Zeit. Elektrochem.*, 1904, **10**, 377—380).—The author criticises the conclusions of Arrhenius and Madsen (Abstr., 1903, ii, 561). He points out that it is not proved that the reaction between toxins and antitoxins is reversible, and that the way in which Arrhenius and Madsen have applied the laws of chemical equilibrium is incorrect, as they have assumed two different equilibrium constants for the same reaction. He suggests that the smaller toxin molecule is perhaps absorbed by the larger colloidal antitoxin molecule, and that it subsequently undergoes a change of nature, much as a colouring matter is first absorbed by the fibre and then changed into an insoluble condition. T. E.

Hepatotoxic Action of the Blood after Intraperitoneal Injection of the Nucleo proteids of the Liver. H. Bierry and André Mayer (*Compt. rend.*, 1904, **138**, 1639—1640).—Hepatotoxins are developed, analogous to nephrotoxins, after injection of liver nucleo-proteid. The degenerative effects seen histologically in the liver are described. W. D. H.

Toxicity of Selachian Blood. Eugène Gley (*Compt. rend.*, 1904, **138**, 1547—1549).—Mosso showed that eel's blood is poisonous.

The present research shows that the serum of the torpedo ray is toxic to dogs, rabbits, and guinea-pigs. One to 2 c.c. per kilo. of body-weight kills a rabbit; with smaller doses, there is lowering of blood-pressure and of body-temperature, paresis, and other symptoms. The frog is more resistant. If the serum is heated to 57°, it loses its poisonous properties. The hæmolytic action of the serum is very marked; by gradually increasing doses, immunisation can be produced. W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Action of Vanadic Acid on Micro-organisms. Thomas Bokorny (*Chem. Zeit.*, 1904, 28, 596—597).—The antiseptic action of vanadic acid on yeasts, moulds, and certain bacteria has been found to be very slight. A. McK.

Decrease of Acid in Wine and the Process of Fermentation Involved. W. Seifert (*Bied. Centr.*, 1904, 33, 488—490; from *Zeit. Landw. Versuchswes. Oesterr.*, 6, 567—585).—The decrease of acidity in wine is caused by special bacteria, especially *Micrococcus malolacticus.* Malic acid is converted into lactic acid and a very small amount of volatile acids; other acids (succinic, *d*-tartaric, *l*-tartaric, citric, malonic, lactic, and acetic acids) are not attacked. In alcoholic solutions, a production of acetic acid may take place. When malic acid and sugar are present, an increase in acidity takes place, more acid being produced than lost.

Yeast acts comparatively slightly on malic acid and does not produce lactic acid. Acetic acid bacteria may also decompose malic acid as well as many other acids.

The micrococcus decomposes malic acid in presence of 12—13 per cent. (vols.) alcohol, and its activity is increased by inactive or dying yeast. Its action is only slight in the case of wines deficient in nitrogen. N. H. J. M.

Production of Volatile Phosphorus Compounds in Putrefaction. Ch. Yokote (*Arch. Hygiene*, 1904, 50, 118—127).—No volatile compound of phosphorus was obtained from putrefying brain, fish, or cheese during 10—20 days, and no reduction of sodium phosphate or sodium hypophosphite was observed. The experiments were under both aërobic and anaërobic conditions.

The conclusion is drawn that no reason exists for supposing that the gases produced during putrefaction readily become injurious owing to the presence of hydrogen phosphide.

Two sources of error were detected and avoided. When india-rubber is employed, positive results may be obtained; a second error may be caused by the compound of silicic acid with ammonium molybdate being supposed to be the phosphoric acid compound.

N. H. J. M.

Decomposition of Selenium Salts by means of Micro-organisms. B. Gosio (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 642—645).—Like the tellurites (see this vol., ii, 503), the selenites are readily attacked by micro-organisms, with formation of a red substance, probably metallic selenium. This decomposition is brought about by a very large number of micro-organisms and may be used for the detection of bacterial life. The most suitable method of carrying out the reaction is to add 1 or 2 drops of a 20 per cent. solution of the selenite to a vigorous culture, best 20—24 hours old, of the organism. At a favourable temperature, the change becomes visible in about 10 minutes and a copious precipitate forms in 30—40 minutes. The sensitiveness of the selenite to change by any particular organism is best observed by mixing the selenite with the culture medium before inoculation. The author divides bacteria into 3 groups, the members of which give with a selenite (1) a very marked reaction, (2) a less marked but distinct reaction, and (3) a doubtful reaction. T. H. P.

Formation of Hydrogen Sulphide by Alcoholic Fermentation. M. Emmanuel Pozzi-Escot (*Chem. Centr.*, 1904, i, 1661; from *Bull. Assoc. Chim. Sucr. Dist.*, 21, 1071—1073).—When a sulphate or sulphite is contained in a liquid which is undergoing alcoholic fermentation, hydrogen sulphide is formed and the wines acquire a characteristic putrid taste. Hydrogen sulphide is also frequently generated in the manufacture of spirits, especially from molasses. The formation of this gas is always associated with a disturbance of the normal functions of the yeast. The source of the yeast, its method of culture, the filling of the vat, and the kind of fermentation are factors which may influence the result. E. W. W.

Action of Alkaline Salts on Living Substance. N. C. Paulesco (*Compt. rend.*, 1904, 138, 1728—1730).—The minimal amounts of various salts of the alkali metals which prevent the formation of carbon dioxide by yeast are given in tabular form. The amounts are proportional to their molecular weights. W. D. H.

Yeast from the Cane Sugar of Nicaragua. M. Emmanuel Pozzi-Escot (*Chem. Centr.*, 1904, i, 1661; from *Bull. Assoc. Chim. Sucr. Dist.*, 21, 1007—1008).—A sample of yeast from a distillery in Nicaragua has been found to contain yeast cells of a peculiar form which had a certain analogy to that of *Saccharomyces pastorianus*. The yeast and the fermented liquor had the odour of the cane sugar juice. At the ordinary temperature, dextrose and maltose are only partially fermented by the yeast, but at 30—35° the action is rapid, maltose being the more quickly attacked; lactose and galactose are completely oxidised. Wines containing 14—15 per cent. of alcohol may be obtained by means of this yeast, even when used before it is completely acclimatised. Under suitable conditions of temperature, the yeast does not appear to be injured by the presence of a large quantity of sugar. E. W. W.

Length of Life of Dried Yeasts. H. WILL (*Chem. Centr.*, 1904, i, 1578—1579; from *Zeit. f. ges. Brauw.*, 27, 269—271). —The examination of a number of old samples of dried yeasts has shown that yeast, generally speaking, retains its vitality for an extremely long time. Not only do the various groups of yeasts differ, however, in this respect, but the members of these groups are also unlike. The wild yeasts were found to live longer than the cultivated yeasts, even in cultures which consisted mainly of beer yeasts. In a sample preserved with asbestos, a wild yeast was found to be alive after 17¼ years. *Saccharomycetes apiculatus*, preserved with wood, had retained its vitality after 3 years, but not after 10¼. The top-fermenting succumbed in less time than the bottom-fermenting yeasts, and in no case lived more than 10¼ years. A large number of cells of a bottom-fermenting yeast mixed with wood-charcoal were found to be capable of causing fermentation after 13 years and 2 months. The length of life is also dependent on other conditions, and especially on the nature of the material with which the yeast is mixed. Wood charcoal appears to be the most favourable for the retention of vitality, and gypsum and kieselguhr less so than wood or asbestos. Temperatures below 0° prolong life, whilst higher temperatures shorten it. Exclusion of air and a comparatively low amount of water which is not subject to alteration by variation of other external conditions also act favourably. From 3—6 per cent. of water appears to be the most suitable amount. The method used in drying the yeasts has also some influence on the duration of life. E. W. W.

Detection of Beer Yeast in Press Yeast by means of Biological Analysis and the Introduction of a Definite Type of Yeast in the Manufacture of Press Yeast. PAUL LINDNER (*Chem. Centr.*, 1904, i, 1579; from *Zeit. f. ges. Brauw.*, 27, 269—271). —This paper refers mainly to matters of biological rather than of chemical interest. The different types of yeast may be distinguished by their initial forms of germination. The homogeneity of a yeast may be tested by comparing the germination forms in a number of drop cultures.

At least 90 per cent. of the commercial press yeasts form branched germination forms, and the cells do not appear to adhere together and form flakes in the way most bottom-fermenting yeasts do.

E. W. W.

Mode of Utilisation of Ternary Carbon by Plants and Microbes. PIERRE MAZÉ (*Ann. Inst. Pasteur*, 1904, 18, 277—303. Compare Abstr., 1902, ii, 577, 578, and 1903, ii, 36).—Yeast possesses a very limited anaërobic life. Under these conditions, acetic acid is produced at the expense of sugar, the yeast, at the same time, assimilating alcohol. The fermentation is thus similar to those produced by strictly anaërobic ferments, from which it, however, differs in not being able to obtain oxygen from water. N. H. J. M.

Circulation of Odoriferous Compounds in Plants. EUGÈNE CHARABOT and G. LALOUE (*Compt. rend.*, 1904, 138, 1229—1231).— In young leaves, the essence is less rich in ethers and total alcohol than the young stems. At the end of the vegetative period, the difference as regards ethers is much greater; the proportion of geraniol is less, and that of linalool greater, in the essence of the leaves than in that of the stems. The conclusion is drawn that the essence of orange stems is less soluble than that of the leaves.

The production of essential oils takes place in the green parts of plants, especially the leaves. A portion of the odoriferous compounds migrates from the leaves to the stems, where their solubility is diminished. N. H. J. M.

Constituents of Asparagus. ERNST WINTERSTEIN and P. HUBER (*Zeit. Nahr. Genussm.*, 1904, 7, 721—730).—The percentage composition of the sap was as follows:

Nitrogen								
Total.	as total proteids.	as coagulable proteids.	as bases.	as ammonia.	as asparagine.	Carbohydrates.	Organic matter.	Ash.
0·1695	0·0247	0·0174	0·0223	0·0092	0·0102	0·874	2·878	0·042

The dry matter contained: total nitrogen, 3·84; crude fibre, 16·41; furfuroids, 6·99; fat, 4·06; and ash, 9·16 per cent. N. H. J. M.

Nuclein Bases in Juice of Beta Vulgaris. HARRY W. BRESLER (*Zeit. physiol. Chem.*, 1904, 41, 535—541).—The amount of nitrogen in the juice of *Beta vulgaris* is 0·2345 gram per litre. Of this nitrogen, 0·29 per cent. exists in the form of heteroxanthine, 1·58 as guanine, 0·81 as xanthine, 0·61 as adenine, 0·91 as hypoxanthine, and 0·69 per cent. as carnine. Full details for the separation of the different compounds are given. J. J. S.

Composition of Carobs of Different Origins. BALLAND (*J. Pharm. Chim.*, 1904, [vi], 19, 569—571).—Specimens of commercial carobs are found to possess the following percentage compositions: water, 9 to 13; nitrogenous compounds, 5 to 7; cellulose, 8 to 12; fat, less than 1; ash, 2; sugars (dextrose and sucrose in variable proportions), 30 to 43; phosphoric oxide, 0·16 to 0·24. G. D. L.

Various Kinds of Cinnamon. JOSEF HANUŠ (*Zeit. Nahr. Genussm.*, 1904, 7, 669—672).—The following amounts of cinnamaldehyde were found in different varieties of cinnamon, the method employed for the estimation being that previously described by the author (Abstr., 1903, ii, 768): Ceylon cinnamon, 1·74—2·19 per cent.; cassia cinnamon, 2·08—3·81 per cent.; the buds of the latter, 3·70—6·00 per cent.; and cinnamon chips, 1·23—1·42 per cent. Other barks containing cinnamaldehyde and some so-called cinnamons were also examined, the results obtained being: East Indian cinnamon (*Cinamomum Tamata*), 1·80 per cent.; wild Ceylon cinnamon, branches, 0·12; stem, 1·80 per cent.; Massoy cinnamon from Java (*C. Kiamis Nees*), none; *C. ceylanici Nees*, a trace; clove cinnamon (*Cassia caryophyllata*), 1·51 per cent.; and "white" cinnamon (*Canella alba*), none.

The whole of the cinnamaldehyde was found to be removed from cinnamon by distilling in a current of steam. It was also ascertained that no aldehyde was present in the form of glucosides. W. P. S.

The Gum of Mangifera indica. P. Lemeland (*J. Pharm. Chim.*, 1904, [vi], **19**, 584—593).—The gum contains 16·57 per cent. of moisture and 3·357 per cent. of ash, and the dry substance is soluble in water to the extent of 39·36 per cent., the solution having $[\alpha]_D$ $-25·33°$. The gum contains an oxydase, yielding a red colour with guaiacol solution.

It contains 71·42 per cent. of sugars, including 25·33 of galactose, and 35·095 of pentoses (arabinose was also separated).

The portion insoluble in water contains moisture, 10·51; and in the dry substance, galactose, 32·08; pentoses, 42·87; total glucoses, 86·28 per cent., having α_D $+ 64·89°$. G. D. L.

Presence of Quinol in the Pear Tree. G. Rivière and G. Bailhache (*Compt. rend.*, 1904, **139**, 81—83).—Quinol to the extent of 3—5 grams per kilogram can be extracted by ether from the buds of the pear tree (*Pyrus communis*), the maximum yield corresponding with the most active stage of vegetation; it is not found in the mature plant because it is oxidised to quinone by the laccase, identical with that of Bertrand (compare this vol., i, 157), contained in the plant. The buds of the apple tree contain phloridzin, but not quinol.
M. A. W.

Fatty Oil of Strawberries. I. Aparin (*J. Russ. Phys. Chem. Soc.*, 1904, **36**, 581—596).—The oil obtained from strawberries has a sp. gr. 0·9345 at 15°/4° and n_D 1·4790 at 25°; saponification number, 193·7; acid number, 6·41; Reichert-Meissl number, 2·1; Hubl's iodine number, 180·3. The insoluble fatty acids of the oil amount to 88·2 per cent., their iodine number being 192·3. The principal acids present are: linoleic acid, about 81 per cent.; linolenic acid, about 10·5 per cent.; and oleic acid. T. H. P.

Relation of Mass Action and Physical Affinity to Toxicity. J. B. Dandeno (*Amer. J. Sci.*, 1904, [iv], **17**, 437—458).—Numerous experiments have been made by various observers on the toxic effect of different chemical compounds on seedlings (see this vol., ii, 283). The author considers that in many of these the death of the seedling was uncertain, and that all failed to take into account a most important factor, namely, the quantity of the solution employed, as his own experiments prove this to be of the utmost importance. The evidence of death of the seedling adopted was inability to afterwards grow in water. The effect of quantity of solution is seen by the fact that in hydrochloric acid of strength $N/2048$ seedlings would live if the quantity of acid was not greater than about 2½ c.c., but died if it exceeded this amount. Similar results were obtained for all the compounds and seedlings, the concentration causing death depending upon the quantity employed. It was also found that the toxic effect was very materially lowered by the addition of substances chemically inactive, as, for example, sand. The toxic effect of carbonic acid is very low, and the author considers it probable that hydrolytic dissociation of carbonates takes place. He protests very strongly against the attempts to always make the physiological effects fit in with the dissociation theory by ascribing all discrepancies to the effect of the undissociated molecule. L. M. J.

Catalytic Properties of Grain and Meal. NEUMANN WENDER and D. LEWIN (*Chem. Centr.*, 1904, i, 1530; from *Oesterr. Chem. Zeit.*, 7, 173—175).—By determining the quantity of oxygen which is liberated from hydrogen peroxide, it has been shown that the enzymes which have a catalytic action do not increase during the germination of the grain. By suitably varying the conditions of temperature, the diastatic properties of the enzymes may be destroyed without affecting their catalytic power. Ether or a solution of 96 per cent. of alcohol by volume has no injurious effect on the enzymes, but a 0·1 per cent. solution of mercuric chloride or silver nitrate, a 0·2 per cent. solution of potassium hydroxide, or a 1 per cent. solution of acetic acid or of hydrochloric acid destroys them. Hydrogen peroxide is rapidly attacked by the meal or the macerated grains. Bran has a very much greater catalytic action than meal of the same kind of corn. The meal prepared from the exterior portions of the grains contains considerably more catalase than that from the interior. Since the catalytic power of a meal is less the finer its state of division, it is possible to distinguish the different kinds of meal by a simple method based on this fact. E. W. W.

Quantity of Soluble and Coagulable Nitrogen contained in Malt. KARL DINKLAGE (*Chem. Centr.*, 1904, i, 1529; from *Zeit. ges. Brauw.*, 27, 249—251. Compare *ibid.*, 26, 585).—The total nitrogen, the soluble nitrogen, and the coagulable portion of the latter have been determined in the case of 8 bright golden malts of the Pilsener and Vienna types and 13 dark malts of the Munich character. The colour of the former varied from 0·15 to 0·3 and of the latter from 0·55 to 2·35 *N*/10 iodine solution. The malts contained from 1·5 to 1·8 per cent. of nitrogen (9·4—11·4 per cent. of proteid) calculated on the dry malt, with the exception of one sample which gave a lower value and two which contained more. The results show that, generally speaking, the amounts of soluble and coagulable nitrogen are independent of the total nitrogen or proteid contained in the malt, but that some relationship exists between the soluble and the coagulable nitrogen. When the temperature of the kiln is raised, both the quantity of soluble nitrogenous material and the coagulable portion decrease, the effect on the latter being greater than on the former. From the results obtained, it may be concluded that in cases of malts containing 9—11 per cent. of proteid, the bright golden-yellow malts contain 0·48—0·54 of soluble and 0·11—0·13 per cent. of coagulable nitrogen, whilst the dark and very dark malts contain 0·39—0·48 per cent. of soluble nitrogen. The coagulable nitrogen of the dark malts varies from 0·08—0·11, and that of the very dark malts from 0·07 to 0·08 per cent. Malts which do not show relationships of this character

have an abnormal composition or have been subjected to unsuitable conditions in the kiln.
E. W. W.

Amount of Tannin contained in Barley, Malt, and Worts to which Hops have not been added. Albert Reichard (*Chem. Centr.*, 1904, i, 1449; from *Zeit. ges. Brauw.*, 27, 229—235, 253—258, 271—275).—The tannin compound contained in barley is soluble in alcohol or hot water, but the greater portion separates from the aqueous solution on cooling. The alcohol which is formed on germination subsequently dissolves a portion of the tannin compound, and the wort also contains this substance partly in a state of emulsion and partly as a finely divided powder or a coarse granular or flocculent precipitate. The latter forms cause turbidity in the beer, whilst the emulsion and fine powder form sediment of a particularly solid character ("beer stone"). The yeast cells themselves may also be injured by the sediment. A precipitate similar to that caused by the tannin compound is also formed by lactic acid in worts which do not contain hops, but the compound in this case is insoluble in alcohol.
E. W. W.

Migration of Odoriferous and Colouring Substances to Milk. S. Dombrowski (*Arch. Hygiene*, 1904, 50, 183—191).—The milk of goats fed with *semina anisi* and *fœniculi* acquired the odour of these substances. Similar results were obtained with garlic, the taste of which was retained by the milk even after boiling. In the case of fenchel and anis, the odour was moderately strong and disappeared when the milk was boiled. Feeding with yellow turnips and *Ac. chrysophanicum med.* imparted a very slight amount of colour to the milk.

When milk was kept for half an hour in a room with iodoform and *oleum anisi*, the odour of these substances was rapidly acquired by the milk and was retained for twelve hours. The odours of phenol, *oleum terebinthini*, and formalin are also rapidly acquired, but are soon lost. The odour of bleaching powder was only to a slight extent imparted to the milk.
N. H. J. M.

Constituents of Emmenthaler Cheese. II. Ernst Winterstein (*Zeit. physiol. Chem.*, 1904, 41, 485—504. Compare Abstr., 1902, ii, 687).—The following nitrogenous compounds have been isolated from a three-months-old Emmenthaler cheese and are regarded as primary decomposition products: glycine, alanine, aminovaleric acid, leucine, pyrrolidine-2-carboxylic acid, aspartic acid, glutamic acid, tryptophan, histidine, and lysine. The amounts of these products vary in different cheeses. Simpler nitrogenous compounds, namely, ammonia, guanidine, tetramethylenediamine, and pentamethylenediamine, also occur and are regarded as secondary decomposition products, probably derived from arginine and lysine.

The presence of hydroxy-amino-acids has not been definitely settled. Succinic, lactic, and citric acids are always present together with peptones (polypeptides?).

Choline was extracted from a ripe cheese which produced poisonous effects.

Caseoglutin (Abstr., 1902, ii, 688), on hydrolysis with concentrated hydrochloric acid, yields histidine, 2·3; arginine, 1·26; and lysine, 2·9 per cent. J. J. S.

Removal of Poison from Tobacco Smoke. Hermann Thoms (*Bied. Centr.*, 1904, 33, 482—483; from *Chem. Zeit.*, 1904, 28, 1).—The essential constituents of tobacco smoke are nicotine, pyridine bases, ammonia, methylamine, pyrrole, hydrogen sulphide, hydrogen cyanide, butyric acid, carbon dioxide and monoxide, phenol, and tarry products. It was found that cotton wool soaked in a solution of ferric chloride in glycerol retains the very poisonous ethereal oil, the hydrogen sulphide, and about half of the hydrogen cyanide and nicotine. A complete absorption of the products is not possible, besides being, of course, undesirable.

Richard Kissling (*ibid.*, 483—484) points out that the extent of absorption depends on the time employed, and that in practice the speed of the smoke would be about eight times that attained in the experiments. N. H. J. M.

Occurrence of Unusually Large Amounts of Injurious Sulphur Compounds in Peat. Hermann Minssen (*Bied. Centr.*, 1904, 33, 433; from *Mitt. Ver. Förd. Moorkultur*, 1904, 1).—A sample of surface soil (peat) from Siberia contained 3·940 per cent. of sulphuric acid as ferrous sulphate and 3·346 per cent. of free sulphuric acid, besides 25·595 per cent. of undecomposed iron sulphide. The subsoil (20—60 cm.) contained 7·059 per cent. of sulphuric acid as ferrous sulphate, 6·055 per cent. of free acid, and 37·15 per cent. of iron sulphide. The total sulphur (as SO_3) in forms injurious to vegetation amounts to 203,458 kilos. per hectare in the surface soil (to 20 cm.) and 108,400 kilos. in the subsoil.

The original surface of the soil, to a depth of over 2 feet, had been removed a long time before the samples were taken. N. H. J. M.

Ammonia or Sodium Nitrate? H. Clausen (*Bied. Centr.*, 1904, 33, 434—437; from *Ill. landw. Zeit.*, 1903, 892).—In 1901, with high rainfall in April and May, ammonium salts gave very good results, the yields of winter rye and potatoes being considerably greater than with sodium nitrate. In 1902, with a dry April and a wet May, sodium nitrate gave the best results with rye, whilst in the case of oats the best results were obtained with ammonium salts.

N. H. J. M.

Manurial Experiments with Lime. Dmitri Prianischnikoff (*Jour. exper. Landw.*, 1903, 4, 267—268).—The results of experiments with wheat and lupins grown in Russian black soil without lime and with 0·25, 0·5, and 1 per cent. of lime showed that the yields of both increased with the amount of lime. The yield of oats, in acid loam soil, was greatly increased by 0·5 per cent. of lime, and was reduced by 1 per cent.

The general opinion that lime is injurious to lupins is probably due to their usually being grown in sandy soils.

Small amounts of lime were distinctly beneficial to nitrification in black soil. N. H. J. M.

Analytical Chemistry.

Use of Hydrogen Chloride in Volumetric Analysis. Georg Lunge (*Zeit. angew. Chem.*, 1904, 17, 886).—The author observes that the process proposed by Raschig (this vol., ii, 441) has already been described by Moody (Trans., 1898, 73, 658). L. de K.

Estimation of Sodium Perchlorate in Saltpetre. H. Lemaître (*Chem. Centr.*, 1904, i, 1427—1428; from *Mon. Sci.*, [iv], 18, 253—254).—Five grams of the dried sample are mixed with 3 grams of dried sodium sulphite and fused in a platinum crucible. The mass is dissolved in water and mixed with 200 c.c. of a 4 per cent. barium nitrate solution. The filtrate is boiled with 8·2 c.c. of *N*-alkali hydroxide and 1·2 gram of sodium persulphate, and, after filtering, the liquid is first neutralised with acetic acid, using phenolphthalein as indicator, and the chlorine is then titrated with *N*/10 silver solution. Any iodine present may be estimated colorimetrically by Anzenat's method. L. de K.

Estimation of Sulphuric Acid in the Presence of Iron. Georg Lunge (*Zeit. angew. Chem.*, 1904, 17, 913—917, 949—953).—Silberberger (Abstr., 1903, ii, 751) has proposed to substitute strontium chloride in alcoholic solution for barium chloride, and has even recommended the process for the estimation of sulphur in pyrites, stating that Lunge's barium chloride process, which involves the previous separation of the iron with ammonia, cannot be said to be accurate as there is a loss caused by the retention of sulphuric acid in the iron precipitate, which is, however, more or less compensated by the impurities in the barium sulphate.

The author defends his process against Silberberger's attack and also criticises the strontium process, which, although accurate enough for sulphates, cannot be used in the presence of iron, as the strontium sulphate is strongly contaminated with iron, which causes the result to be untrustworthy. A further drawback to the strontium process is the difficulty in obtaining clear filtrates. L. de K.

Estimation of Nitrogen according to Dumas' Method. Anton Landsiedl (*Chem. Zeit.*, 1904, 28, 643—644).—A convenient form of measuring tube is described for collecting the nitrogen during a Dumas estimation. A. McK.

Estimation of Phosphorus and Nitrogen in Organic Substances. Fritz von Konek (*Zeit. angew. Chem.*, 1904, 17, 886—888).—About 0·5 gram of the substance reduced to an impalpable powder is mixed by means of a wire with 10—15 grams of sodium peroxide contained in a nickel crucible. If the substance is very poor in carbon, a little of some highly carbonaceous material should be added. After screwing on the lid, the crucible is placed in cold water and the contents are fired by a red-hot wire. The mass now contains the phosphorus as phosphate and the nitrogen as nitrate, which are then estimated by the usual processes. L. de K.

Estimation of Arsenic. John Köhler (*Arkiv Kem. Min. Geol.*, 1904, 167—184. Compare Klason and Köhler, Abstr., this vol., ii, 208).—In the ordinary methods for estimating arsenic in wall-papers, &c., organic matter often distils over and interferes with the titration. The authors therefore recommend that the distillate be caught in nitric acid, evaporated, and treated with potassium permanganate and sulphuric acid until all the organic matter is destroyed. The arsenic compounds are then reduced to arsenious anhydride by means of sulphur dioxide in presence of a little sulphuric acid, and, after evaporating to remove excess of sulphur dioxide, the sulphuric acid is neutralised by means of sodium hydrogen carbonate. Instead of collecting the distillate in nitric acid, this may be replaced by potassium permanganate solution or a dilute solution of hydrogen peroxide, but subsequently excess of the latter must be removed completely. This method of procedure is found to yield good results.

On preparing mirrors of known amounts of arsenic by reduction with sodium carbonate and potassium cyanide, it was found that, using 1·0—0·1 mg. of arsenic, never more than 40 per cent. found its way into the mirror; the amount of the loss depends on the quantity of arsenic employed, the reduction method used, and the nature of the arsenic compound. Better results are obtained with the Marsh apparatus, but comparison of the arsenic mirror with standard mirrors is not good, and it is best to dissolve the mirror and determine the arsenic as above. T. H. P.

Sodium Peroxide in Qualitative Organic Analysis. Fritz von Konek (*Zeit. angew. Chem.*, 1904, 17, 771—774).—Into a strong cylindrical nickel or steel crucible, fitted with a perforated lid through which passes a 10 cm. long nickel or steel tube, are introduced 5—10 grams of pure sodium peroxide, and a pinch of the finely-powdered sample is added and thoroughly mixed by means of an iron wire. When dealing with volatile compounds, which must be tested for nitrogen, &c., a little of a compound rich in carbon, such as camphor, should be added. After fixing on the lid, the crucible is placed in a basin containing cold water, and the mass is then ignited by dropping a red-hot iron wire into the tube. The reaction is somewhat violent, but free from danger; the experiment is therefore suitable for the lecture table.

The mass contains the carbon as carbonate, the nitrogen as nitrate, sulphur as sulphate, phosphorus as phosphate; halogens will be found as oxygen compounds. The usual tests for these various substances are then applied. As regards the nitrogen, the author thinks his process is an improvement on Lassaigne's test, heating with metallic sodium and testing the mass for cyanide. L. DE K.

Estimation of Organic Carbon by means of Sodium Peroxide. FRITZ VON KONEK (*Zeit. angew. Chem.*, 1904, **17**, 888—891).—The method is briefly as follows: the substance (see preceding abstract) is oxidised with sodium peroxide, the mass is dissolved in water and made up to a definite volume. An aliquot part is then mixed with a solution of barium chloride of known strength until the carbonate is completely precipitated. The liquid is again made up to a definite bulk, and when the precipitate has completely settled it is passed through a rapid filter, and in an aliquot part of the filtrate the excess of barium is estimated by precipitation as sulphate. From this is calculated the amount of barium carbonate which has precipitated, and, of course, represents the organic carbon.

Great care should be taken to avoid as much as possible contact with the air, and the water used should be free from carbon dioxide. A blank experiment should also be made to ascertain the amount of carbon dioxide contained in the sodium peroxide. Sulphur, if present, should be estimated separately and allowed for. L. DE K.

Spectrophotometric Estimation of Small Quantities of Carbon Monoxide in the Air. LOUIS DE SAINT-MARTIN (*Compt. rend.*, 1904, **139**, 46—49).—When a dilute solution of fresh dog's blood containing about 0·15 per cent. of oxyhæmoglobin is shaken with 10 times its volume of air containing 0·20 to 1 per 1000 of carbon monoxide, the solution absorbs a small quantity of the gas forming carboxyhæmoglobin, and the ratio of the carboxyhæmoglobin to the original oxyhæmoglobin increases with the proportion of carbon monoxide in the air; the value of this ratio is determined by means of a spectrophotometric method for specimens of air containing 0·25, 0·50, 0·70, or 1·00 per 1000 of carbon monoxide, and a curve constructed having the ratios as ordinates and the proportions of carbon monoxide as abscissæ. By means of this curve, it is possible to determine the amount of carbon monoxide contained between the above limits in a sample of vitiated air; the air is agitated with the requisite quantity of blood solution, the value of y determined spectrophotometrically, and the corresponding value of x read from the curve.

M. A. W.

Estimation of Potassium. D. SIDERSKY (*Ann. Chim. anal.*, 1904, **9**, 207—209).—An official report. For technical purposes, the potassium should be estimated by means of platinic chloride according to Fresenius' method. One gram of the platinum double salt represents 0·3056 gram of potassium chloride.

The estimation as potassium perchlorate, according to Schlœsing's method, also gives trustworthy results. One gram of perchlorate represents 0·5382 gram of potassium chloride. L. DE K.

Estimation of Potassium. Nazareno Tarugi (*Gazzetta*, 1904, 34, i, 324—341).—The principle of this method is as follows: when a suitably concentrated solution of sodium persulphate is added to a solution of potassium sulphate, the potassium persulphate formed mostly separates in a solid, crystalline condition, only a small proportion of it remaining in solution. By titrating the sodium persulphate solution with standard sodium hydroxide solution, both by itself and after mixing with the potassium salt and making a suitable correction for the potassium persulphate remaining in the solution, the amount of potassium salt in the original liquid can be determined.

The author has measured the solubility of potassium persulphate in water and in various salt solutions, which all give the same values, so that the allowance for solubility becomes greatly simplified. The solubility curve consists of four straight lines represented by the four equations: $y = 0{\cdot}108x + 1{\cdot}62$ (0° to 9°); $y = 0{\cdot}008x + 2{\cdot}52$ (9° to 10°); $y = 0{\cdot}108x + 1{\cdot}52$ (10° to 15°), and $y = 0{\cdot}270x - 0{\cdot}91$ (15° to 40°), where y is the solubility and x the temperature in ° C. From these values, the equations by which the corrections to be applied to the amount of K_2O found by this method are readily found, and are: $y = 0{\cdot}0376x + 0{\cdot}564$ (0° to 9°); $y = 0{\cdot}00278x + 0{\cdot}8773$ (9° to 10°); $y = 0{\cdot}0376x + 0{\cdot}529$ (10° to 15°), and $y = 0{\cdot}094x - 0{\cdot}3164$ (15° to 40°).

The concentration of the sodium persulphate solution should not be less than 14 per cent., and it is best to take 200 grams of the commercial salt and make up to 1 litre, afterwards filtering from any slight turbidity. To titrate this solution, 10 c.c. of it are diluted with distilled water to 100 c.c. and 5 c.c. of the diluted solution boiled for about 20 minutes, the evaporated water being replaced from time to time. A few drops of phenolphthalein are added, and $N/10$ sodium hydroxide solution run in until the red colour persists after 5 minutes' boiling. The sodium persulphate solution, which should be re-tested from time to time, should not deposit crystalline matter, even on the addition of a crystal of potassium persulphate.

In estimating the potassium in any product, a weighed quantity of about 1 gram of it is treated with concentrated sulphuric acid and afterwards heated and even ignited to expel the excess of acid and any ammonium salts. The residue is dissolved in 10 c.c. of water and the solution, filtered if necessary, mixed with 10 c.c. of the standard sodium persulphate solution and placed in a thermostat until its temperature becomes constant. A very small crystal of potassium persulphate is then added to precipitate that in solution. Ten c.c. of the clear, supernatant liquid are then removed, diluted to 50 c.c., and 5 c.c. of this solution titrated with $N/10$ sodium hydroxide solution as described above. The difference in the titre of the sodium persulphate solution before and after mixing with the potassium solution, allowing for the dilution, is multiplied by 0·0047, and the value thus obtained, corrected for the potassium persulphate dissolved, represents the K_2O present.

If no deposit of crystalline potassium persulphate can be obtained, even at 0°, a larger quantity of the material must be employed.

T. H. P.

Separation of Calcium and Magnesium. CARL STOLBERG (*Zeit. angew. Chem.*, 1904, 17, 741—744, 769—771).—A criticism of the oxalate process. When the magnesium strongly predominates, it has been recommended to effect a separation with sulphuric acid in the presence of alcohol; but, according to the author's experiments, it is difficult so to regulate the proportion of alcohol that the calcium is completely precipitated as sulphate without occlusion of magnesium sulphate. The following modification, however, yields good results.

The mixed calcium and magnesium salts are converted into anhydrous sulphates by heating with sulphuric acid until the excess of acid has completely evaporated. The dry mass is now treated with sufficient hot water to dissolve all the magnesium sulphate and then mixed with excess of a mixture of 10 vols. of absolute alcohol and 90 vols. of methyl alcohol. This causes the complete separation of the calcium sulphate without co-precipitation of magnesium, and after washing with a mixture of 5 vols. of absolute alcohol and 95 vols. of methyl alcohol, the precipitate is dried and ignited. L. DE K.

Volumetric Method for the Estimation of Mercury Fulminate. HENRY W. BROWNSDON (*Chem. News*, 1904, 89, 303—304).—For the estimation of mercury fulminate in cap or detonator compositions, the following method is given. From 0·12 to 0·25 gram of the composition is weighed into a 100 c.c. flask containing about 50 c.c. of water, 1 gram of pure sodium thiosulphate is added, and the contents of the flask well shaken until the fulminate is decomposed. This takes about 2 minutes. The mixture is then diluted with water to 100 c.c., filtered, and 25 c.c. of the filtrate titrated with $N/10$ sulphuric acid, using methyl-orange as indicator. The sulphuric acid is standardised on pure mercury fulminate prepared by dissolving the ordinary commercial product (1 mol.) in pure potassium cyanide (1 mol.) solution, precipitating the mercury fulminate from the solution of the double salt by means of dilute nitric acid, washing the precipitate with water until free from acid, and drying it at a temperature of 80—90°. The amount of mercury fulminate in the portion of composition taken for analysis should not exceed 0·05 gram, otherwise the alkali set free tends to react with the finely-divided antimony sulphide. W. P. S.

Standardisation of Permanganate Solutions. FREDERICK DUPRÉ (*Zeit. angew. Chem.*, 1904, 17, 815—817).—Treadwell has proposed to standardise permanganate solutions by means of electrolytically-precipitated metallic iron, and the author confirms the accuracy of the process. Equally trustworthy results may, however, be obtained by Volhard's iodometric process, in which the iodine liberated by permanganate from potassium iodide in acid solution is titrated with sodium thiosulphate. L. DE K.

Stability of Standard Solutions of Potassium Permanganate and Ammonium Oxalate. WALTER M. GARDNER and BARKER NORTH (*J. Soc. Chem. Ind.*, 1904, 23, 599).—The authors' experiments prove that, both in the solid state and in solution, pure potassium permanganate remains unaltered in strength for at least 12 months, even when exposed to light, if kept in well-stoppered bottles. Solutions of ammonium oxalate were found to deteriorate at the rate of about 1 per cent. per fortnight. In the solid state, ammonium oxalate and ferrous ammonium sulphate retain their strength for at least 12 months.

W. P. S.

Iodometric Estimation of Ferric Iron. Auguste Hollard (*Ann. Chim. anal.*, 1904, 9, 220).—The author states that he has used long ago the same process recently proposed by Namias and Carcano (this vol., ii, 368), substituting, however, carbon disulphide for chloroform. L. de K.

Analysis of Ferro-silicon. H. Cantoni (*Ann. Chim. anal.*, 1904, 9, 203—204).—0·5 to 0·6 gram of the finely-powdered substance is heated in a copper crucible with 7—8 grams of sodium peroxide. The fused mass is then removed from the crucible with warm water, and evaporated with excess of hydrochloric acid to separate the silica. The filtrate is freed from any copper by means of hydrogen sulphide, and the iron and other impurities are then estimated as usual. L. de K.

Analysis of Chrome Iron Ore. Louis Duparc (*Ann. Chim. anal.*, 1904, 9, 201—203).—0·3 gram of chrome iron ore in impalpable powder is ignited with sodium carbonate in a platinum crucible for 8 hours. The mass is then removed from the crucible with hot water, and the liquid is evaporated with excess of hydrochloric acid to separate any silica. The filtrate from the silica is precipitated with ammonia, and the mixed hydroxides of iron, chromium, and aluminium are collected and ignited; the filtrate may be examined for calcium, &c.

The mixed oxides are then again ignited with sodium carbonate. The mass is boiled with water, which dissolves the chromium and aluminium as sodium salts, and leaves the iron oxide insoluble. The filtrate is cautiously acidified with nitric acid, the aluminium is precipitated with ammonia, and in the filtrate the chromic acid is estimated by precipitation with lead acetate; or it may be reduced by boiling with hydrochloric acid and then precipitated with ammonia.

L. de K.

Detection of Nickel and Cobalt. Stanley R. Benedict (*J. Amer. Chem. Soc.*, 1904, 26, 695—700).—*Detection of nickel only in the presence of cobalt.*—The solution is mixed with excess of sodium peroxide and heated to boiling. The precipitate is washed, and treated with a cold saturated solution of oxalic acid. To the filtrate are added a few drops of dilute solution of potassium ferricyanide, and then a slight excess of sodium hydroxide. A heavy black precipitate or a considerable darkening reveals the presence of nickel.

Detection of both metals in the presence of one another.—The mixed sulphides are oxidised with nitric acid, the excess of acid is expelled, and the residue dissolved in a little water. To 3 c.c. of the solution are added 6—8 c.c. of aqueous sodium hydroxide, and the colour of the precipitate is observed. If cobalt is in excess the precipitate will have a dark blue colour; if nickel is present in very small amount the colour will not change within a few seconds to a bright pink, but if nickel is present in large amount the change of colour will be retarded for half an hour or more, and it will turn to a dirty grey. In the absence of nickel, the change of colour is practically instantaneous. If nickel is present in excess, the precipitate will not be a dark blue, but a somewhat bluish-green. If cobalt is absent, the colour will be a permanent pale-green. L. DE K.

Estimation of Molybdenum in Steel Alloys. FREDERICK VAN DYKE CRUSER and EDMUND H. MILLER (*J. Amer. Chem. Soc.*, 1904, 26, 675—695).—The authors have arrived at the conclusion that the best method for the estimation of molybdenum in steel alloys is the sulphide separation. The sulphates, obtained in the usual way by treating the alloy with nitric and sulphuric acids, are dissolved in water containing sulphuric acid, the liquid is saturated with hydrogen sulphide, and then heated in a closed (pressure) bottle for 2 hours in the boiling water-bath. If the solution contains tungstic acid, its precipitation by hydrogen sulphide may be prevented by first adding some tartaric acid.

The molybdenum sulphide is washed and subjected to treatment with nitrohydrochloric and sulphuric acids. When copious sulphuric acid fumes appear, the mass is allowed to cool, then diluted with water, and any traces of iron oxide are precipitated by adding excess of ammonia. The filtrate is then mixed with excess of sulphuric acid, and the molybdenum estimated as usual by passing the solution through a zinc reductor and titrating with permanganate.

L. DE K.

Limit of Error in the Volumetric Estimation of Small Amounts of Gold. RALPH N. MAXSON (*Amer. J. Sci.*, 1904, [iv], 466—470. Compare Abstr., 1903, ii, 697).—A reply to Rupp (this vol., ii, 150). Whereas Rupp's process with arsenious acid is only applicable when the amount of gold is not less than a few milligrams, the titration process devised by Gooch and Morley can estimate with accuracy small fractions of a mg. of the metal. The aurous iodide formed in the reaction is sufficiently stable not to interfere with the estimation. L. DE K.

Electrolytic Analysis with Rotating Electrodes. R. AMBERG (*Zeit. Elektrochem.*, 1904, 10, 385—386). **Electrolytic Precipitation of Palladium.** R. AMBERG (*Zeit. Elektrochem.*, 1904, 10, 386—387).—Palladium begins to be deposited from an acid solution of the chloride at 0·65 volt, but after a short time palladium peroxide comes down on the anode, the voltage rises to about 1·25, and spongy metal is deposited at the cathode. The same difficulties were encountered when alkaline or ammoniacal solutions were used. When an anode rotating some 600 to 650 times per minute is used, however, no peroxide is formed, even with higher currents. The temperature is best kept at 60—65° and the voltage must not exceed the critical value of 1·25 volts. T. E.

Separation of Palladium in Mineral Acid Solution by Hydrazine. Paul Jannasch and L. Rostosky (*Ber.*, 1904, 37, 2441—2461. Compare this vol., ii, 517, 519).—Hydrazine sulphate precipitates palladium quantitatively from hot mineral acid solutions, partly in the form of metal and partly as oxide. Palladium may thus be readily separated from the more electro-positive metals. In other cases, precipitation of the second metal may take place owing to the catalytic action of the precipitated palladium producing hydrogen in the active form of palladium hydride.

Palladium is separated from aluminium, chromium, uranium, molybdenum, and tungsten by the addition of a hot concentrated solution of hydrazine sulphate to the hot acid solution. The precipitate is dried and reduced in hydrogen. The separation from calcium, strontium, and barium is similar, except that in these cases the use of hydrazine hydrochloride, prepared from benzylideneazine or by saturating hydrazine hydrate with hydrogen chloride, is advisable.

The separation from manganese, cadmium, nickel, and cobalt by means of hydrazine sulphate is also complete, in spite of the existence of sparingly soluble double salts of these metals with hydrazine (Curtius and Schrader, Abstr., 1895, ii, 10). In the case of nickel and cobalt, however, dilute solutions must be employed, and the precipitate must be thoroughly washed.

Owing to the secondary formation of hydrogen, copper is partially precipitated from hot solutions. A complete separation from palladium is possible by adding hydrazine hydrochloride to an ice-cold solution, previously diluted with alcohol. The separation of palladium from tin is effected in hot acid solution. The co-precipitation of antimony is prevented by the addition of citric acid. Arsenic is always partially precipitated from arsenious solutions, but the separation is complete in the case of arsenic acid.

The separation of palladium by this method from mercury, lead, bismuth, silver, platinum, or gold is not possible. None of these metals are precipitated by hydrazine salts alone, but the addition of a palladium salt, or of palladium black, causes precipitation owing to the production of hydrogen. The amount of precipitation varies with the time and with the quantity of the catalytic agent present. C. H. D.

Estimation of Palladium and its Separation from Other Metals by means of Acetylene. Hugo Erdmann and O. Makowka (*Ber.*, 1904, 37, 2694—2697).—The separation of palladium from other metals, such as copper, is not possible by means of Jannasch's hydrazine method (Jannasch and Bettges, this vol., ii, 519; Jannasch and Rostosky, preceding abstract). By aid of acetylene, however, palladium can be separated from the commoner metals as well as from platinum, iridium, rhodium, and gold. When acetylene gas is passed though a strongly acid solution containing palladium and other metals or when a solution of acetylene in water is added, a brown precipitate is deposited, which, on being heated, yields palladium. Experiments are quoted to show that a quantitative separation of palladium from copper may be effected by this method.

A. McK.

Estimation of Alcohol in very Dilute Solutions. Maurice Nicloux (*Ann. Chim. anal.*, 1904, 9, 214—218).—The author defends his dichromate process against Pozzi-Escot's criticism (this vol., ii, 450).

L. de K.

Estimation of Glycerol in Urine. August Herrmann (*Beitr. chem. Physiol. Path.*, 1904, 5, 422—431).—The Zeisel-Fanto method with some modifications, which are described, gives good results with mixtures of urine and glycerol. Urine shows a small yield, even though no glycerol is administered.

W. D. H.

Microchemical Detection of Sugars by means of Phenylhydrazine Acetate. Em. Senft (*Monatsh.*, 1904, 25, 397—421).—Sugars are best detected under the microscope in the form of their osazones. The material to be examined is added to phenylhydrazine acetate in glycerol solution, made by mixing 1 : 10 glycerol solutions of phenylhydrazine hydrochloride and of sodium acetate. The preparation is examined immediately, and again after two days. In most cases, the formation of the osazone is only hastened, but better crystallisation may take place if the preparation is warmed for half an hour on the water-bath. If the osazone does not separate in characteristic crystals, it is dissolved in alcohol and the alcoholic solution evaporated. Osazone preparations are stable to potassium hydroxide or 60 per cent. chloral solution, and may be preserved in glycerol-gelatin.

G. Y.

Reactions with Resorcinol in Urine. Heinrich Rosin (*Zeit. physiol. Chem.*, 1904, 41, 549).—In connection with Adler's observations (this vol., ii, 372), reference is made to the modification of Seliwanoff's reaction previously introduced by the author (Abstr., 1903, ii, 616).

A number of substances, in addition to lævulose, give a red coloration with Seliwanoff's reagent, but in most cases the colour does not persist.

J. J. S.

Estimation of Glycogen. Eduard Pflüger (*Pflüger's Archiv*, 1904, 103, 169—170).—A short description of the author's method. One hundred grams of the freshly-minced organ are boiled for 2 hours with 100 c.c. of 60 per cent. potassium hydroxide. After cooling, 200 c.c. of sterilised water are added and 400 c.c. of 96 per cent. alcohol. The precipitate is collected on a filter, washed once with a mixture of potassium hydroxide, 15 per cent. (1 vol.), and 96 per cent. alcohol (2 vols.), then with 66 per cent. alcohol. The precipitate is dissolved in boiling water, the solution neutralised and filtered. Hydrochloric acid is then added to bring its percentage up to 2·2, and inversion is accomplished in three hours. After cooling, the fluid is neutralised, filtered, and the sugar estimated by the polarimeter. The amount of sugar multiplied by 0·927 gives the amount of glycogen. W. D. H.

Analytical Examination of Urine. Alfred H. Allen and Arnold R. Tankard (*Pharm. J.*, 1904, [iv], 19, 8, 9).—The following modifications of some of the methods in ordinary use are given, the aim being to simplify the processes in such a manner as not to affect their accuracy for medical purposes.

Chlorides.—From 10 to 20 c.c. of the sample of urine are treated with 2 c.c. of sulphuric acid, and, while the mixture is still warm, a cold saturated solution of potassium permanganate is added drop by drop until the pink colour no longer fades, or fades only very slowly. The mixture is then neutralised with sodium hydroxide, using litmus paper as indicator, diluted to 50 c.c., and titrated with silver nitrate solution after adding a little potassium chromate solution. In the case of very dilute and pale urines, the treatment with acid and permanganate may be omitted.

Uric acid.—(Bartley's method.) Fifty c.c. of urine are heated nearly to boiling with 5 c.c. of magnesia mixture and 10 c.c. of ammonia of sp. gr. 0·960. While quite hot, the solution is titrated with $N/50$ silver nitrate solution, using ammonium sulphide to ascertain the end of the reaction. A drop of the liquid is placed on a small disc of filter-paper, the edge of which is then touched with a drop of ammonium sulphide. One c.c. of $N/50$ silver nitrate is equivalent to 0·00336 gram of uric acid.

Phosphates.—Two solutions are required: an aqueous solution containing 35 grams of uranium acetate and 160 c.c. of acetic acid (B.P.) per litre, and one prepared by dissolving 10 grams of sodium acetate and 15 c.c. of acetic acid in water and diluting to 100 c.c. Twenty c.c. of the uranium reagent and 5 c.c. of the sodium acetate solution are heated nearly to boiling and the urine gradually added from a burette. The end of the reaction is reached when a drop of the liquid no longer produces a brown coloration with a little powdered potassium ferrocyanide previously placed on a white plate. The uranium acetate solution is standardised on a solution of pure sodium phosphate.

Albumin.—Minute traces of albumin may be detected by agitating the urine with a few crystals of sulphosalicylic acid, a turbidity or precipitate being formed should albumin be present, which is not affected by heat. Precipitates due to albumoses or peptones dissolve on heating and reappear on cooling. W. P. S.

Indirect Estimation of Fat in Milk. Albert Steinmann (*Ann. Chim. anal.*, 1904, 9, 218—220).—A description of a calculating machine adapted for Fleichmann's formula, in which the fat is calculated from the specific gravity and the percentage of total solids, or, reversedly, the solids from the sp. gr. and fat. L. de K.

Estimation of the Fat in Milk and also the Physico-chemical Constants of the Latter. G. Meillère (*J. Pharm. Chim.*, 1904, [vi], 19, 572—579).—Twenty-five c.c. of the milk are rendered alkaline with ammonia and then shaken with from 22 to 55 c.c. of a mixture of 1000 c.c. of 75 per cent. alcohol and 1100 c.c. of pure ether. The ethereal layer is separated and 10 c.c. of light petroleum are added to it. This causes any non-fatty substances dissolved by the ether to separate out. The ethereal solution is now evaporated and the residue of fat weighed. The aqueous portion is used for the estimation of the non-fatty solids.

Determinations of the specific gravity, surface tension, and electrical conductivity, and estimations of casein and lactose, are also considered to be of use in ascertaining the purity of a sample of milk. These determinations should be made on the milk deprived of its fat, a centrifugal machine answering the latter purpose. W. P. S.

Rapid Estimation of Fat. A. P. BRYANT (*J. Amer. Chem. Soc.*, 1904, 26, 568—573).—Fat in food stuffs or vegetable products may be completely extracted in 2 hours by means of carbon tetrachloride. This solvent has also a great advantage over ether, light petroleum, carbon disulphide, &c., in not being inflammable, and it is inexpensive.

The author uses the Knorr extraction apparatus. L. DE K.

Quantitative Electrolytic Precipitation of Copper. THEODORE W. RICHARDS and HAROLD BISBEE (*J. Amer. Chem. Soc.*, 1904, 26, 530—536).—If it is desired to precipitate copper in a coherent film suitable for careful washing and accurate weighing, it is necessary to decrease as much as possible the volume of the solution and to increase the surface of deposition, and this may be easily attained by spreading the concentrated solution in a thin film between two platinum electrodes. The author uses a pair of concentric platinum crucibles or dishes, the annular space between them serving to contain the film of electrolyte. The vessels are prevented from touching each other by a suitably shaped construction of fine glass rod.

As the deposition of the copper proceeds, the current must be diminished. This is conveniently and automatically effected by using a storage cell at 1·9 volts as the source of the electromotive force.

L. DE K.

Chinese Tallow-seed Oil. L. MYDDLETON NASH (*Analyst*, 1904, 29, 110—111).—This oil is obtained from the seeds of *Sapium sebiferum*. The seeds are first steamed, when vegetable tallow runs out, and then pressed to obtain the oil. The latter has a brown colour and "dries" in about 3 days. The following figures were obtained from an analysis of a sample: sp. gr., 0·9395 at 15·5°/15·5°; free fatty acids (as oleic), 3·1 per cent.; unsaponifiable matter, 0·44 per cent.; iodine value (Hübl), 160·7; insoluble fatty acids, 93·96 per cent.; saponification equivalent, 277; α_D about $-4°$ in a 100 mm. tube; refractive index ν_D, 1·4835 at 20°. W. P. S.

Cod-liver Oil and Other Fish Oils. JOHN F. LIVERSEEGE (*Analyst*, 1904, 29, 210—214).—The analytical constants of a number of cod-liver oils are given and also those of other oils used as adulterants of cod-liver oil. The latter included seal, shark, dugong, haddock, menhaden, whale, brusmer, hoi, and ling oils. As regards specific gravity, menhaden and haddock oils are slightly heavier than cod-liver oil, shark oil notably so (0·962), whilst whale, hoi, and dugong oils are below 0·920. At a temperature of 25°, the butyro-refractometer sharply distinguished most of these oils, menhaden and brusmer being the exceptions. The readings obtained were: seal, 72·7; shark, 87·3; dugong, 60·3; haddock, 84·0; menhaden, 80·7; whale, 65·0; brusmer, 75·0; hoi, 73·7; and ling, 74·0. The cod-liver oils gave values between 76·3 and 80·0. About 84 per cent. of unsaponifiable matter was yielded by the shark oil. This oil had a saponification value of 6·0, of which 2·2 was due to free acid. With the exception of the nitric acid test, the colour reactions were untrustworthy for detecting these oils in cod-liver oil. W. P. S.

The Thermoleometer. An Apparatus for the Detection of Falsifications in Olive Oil and other Vegetable and Animal Oils. Massimo Tortelli (*Chem. Centr.*, 1904, **1**, 1424—1426; from *Boll. Chim. Farm.*, **43**, 193—203).—A suitable apparatus to perform the Maumené test for oils. It consists of a vacuum-jacketed tube, and a thermometer so made as to serve as an efficient stirrer. Twenty c.c. of the oil and 5 c.c. of sulphuric acid of sp. gr. 1·8413 are introduced, and the rise in temperature is noticed. A table is given showing the effect on a number of oils. L. de K.

Saponification of Compounded Oils. Pontus H. Conradson (*J. Amer. Chem. Soc.*, 1904, **26**, 672—675).—2·5—10 grams of the mixture of hydrocarbons and fatty oils are boiled with a definite volume of $N/2$ alcoholic potassium hydroxide in a silver flask connected with a Soxhlet tube filled with glass beads and attached to an Allihn upright condenser. The flask is supported by a tripod, on which are placed two asbestos blocks, a thinner under one and a thicker one with tapered holes cut out in the centre to fit the flask; between these is placed an iron ring on which rests a small iron plate fitting the somewhat concave shape of the bottom of the flask. A direct gas flame is used for the boiling.

When boiled for a sufficiently long time, the excess of alkali is determined by first adding phenolphthalein and a few c.c. in excess of $N/4$ hydrochloric acid. After boiling to expel any carbon dioxide, the liquid is then carefully titrated with $N/4$ potassium hydroxide.

L. de K.

Estimation of Formaldehyde in the Atmosphere. H. Henriet (*Compt. rend.*, 1904, **138**, 1272—1274).—The air is filtered and passed through a U-tube, heated at 250°, and filled with fragments of glass wool mixed with mercury oxide, when the formaldehyde is oxidised to carbon dioxide, which is then absorbed in potash bulbs. The amount of carbon dioxide originally present in the air, as determined by a blank experiment, is subtracted from the observed increase in weight of the bulbs, and the difference corresponds with the formaldehyde.

The method has been tested by slowly volatilising known weights of trioxymethylene in a current of air, and found to give good results. Aromatic hydrocarbons, which, according to Gautier, are present in the air of towns, do not interfere with the determination. The proportion of formaldehyde in normal air varies between 2 and 6 grams per 100 cubic metres. H. M. D.

Detection of Saccharin in Beverages. Antoine Villiers, Louis Magnier de la Source, Ferdinand Rocques, and Marcel Fayolle (*Chem. Centr.*, 1904, 1, 1457—1458; from *Rev. Chim. Appl.*, 7, 144—152).—The liquid freed from alcohol is slightly acidified with acetic acid and precipitated with lead acetate, the excess of which is then removed with sodium phosphate or sulphate. The filtrate is shaken three times with half the bulk of benzene, and, after evaporating this, the residue is dissolved in 10 c.c. of 10 per cent. sulphuric acid, and to the warm solution is added a solution of potassium permanganate until slightly pink; this destroys any salicylic or similar acid. The liquid is now again agitated thrice with benzene, and if the residue has a sweet taste, it is heated as usual with sodium hydroxide for three minutes at 270°, and the mass is then tested for any salicylic acid formed by the action of the alkali on the saccharin. L. de K.

Detection of Albumin in Urines. Renault (*Ann. Chim. anal.*, 1904, 9, 212—214).—When testing strongly acid or amphoteric urines for albumin by means of acetic acid, urates or oxalates may be mistaken for albumin. The author now proposes to first render the sample distinctly alkaline with sodium carbonate, and then to apply the test to the filtrate. L. de K.

An Albumin [in Urine] Soluble in Acetic Acid. Gustave Patein (*J. Pharm. Chim.*, 1904, [vi], 19, 580—584).—The albumin previously found by the author in a sample of urine is not an albumose, since it is coagulated by heat and redissolves on the addition of acetic acid. W. P. S.

Testing Colloids. Edmund J. Mills and Archibald Gray (*J. Soc. Chem. Ind.*, 1904, 23, 526—528).—The method described consists in coating a standard cotton thread with a solution containing a known quantity of the colloid under examination, drawing it through a nozzle 0·5 mm. in diameter, drying it, and determining the modulus of elasticity of the coat. The value of this modulus is directly related to the stiffening power of the colloid. Brook's No. 12 white cotton was employed in the experiments, and was carefully singed before coating. The coated threads were allowed to dry completely at the ordinary temperature by hanging them up and attaching a weight of 18 grams at their lower ends. The apparatus consisted of a couple of blocks capable of being moved towards or from each other by means of a right and left screw working below them. Each block carried a length of glass tubing. A length of coated thread was placed with either end in the tubes, its length measured, and the deflection caused by adding a given weight, and also the radius of the thread determined by a kathetometer. The formula for the modulus E in the case of a circular section (kilos. per sq. millimetre of section) is: $E = 1/12 \times P/s \times l^3/\pi r^4$, where P = weight (kilos.) attached; l = exposed length (millimetres) of thread; s = deflection produced; and r = radius of the thread. The value of the modulus for the thread alone was found to be 86·9, and this was deducted from all the observations. The colloids examined were potato starch, maize starch, and gum arabic. These were found to have the comparative elasticities of 3, 4, and 7 respectively. In the case of potato starch and gum arabic, this ratio was strictly proportional to their prices. W. P. S.

Van Deen's Reaction. Dioscoride Vitali (*Gazzetta*, 1904, **34**, i, 348—358).—According to Tarugi (*Gazzetta*, 1903, ii, 216; this vol., ii, 220), van Deen's reaction is of no value for the detection of blood spots, since potassium thiocyanate gives the same reaction. The author shows, however, that the reactions in the two cases display marked differences, especially as regards their sensitiveness.

T. H. P.

Estimation of Soil Acidity. Fletcher P. Veitch (*J. Amer. Chem. Soc.*, 1904, **26**, 637—662).—As a result of a lengthy investigation, the author proposes to estimate the water-soluble acidity and the negative acidity due to readily attacked silicates by means of the sodium chloride method, using a proper correcting factor. The total apparent acidity is then determined by the lime-water method, and by allowing for the acidity in the saline solution the acidity due to insoluble organic matter is obtained.

The degree of acidity by the improved lime-water process is estimated as follows: to three portions of soil, each consisting of as many grams as there are mgrms. of calcium oxide per c.c. in the lime-water, 50 c.c. of pure distilled water are added, and to the first is then added 10, to the second 20, and to the third 30 c.c. of the standard lime-water. After quickly drying on the steam-bath, the residues are transferred to stoppered Jena flasks containing 100 c.c. of water. After remaining overnight with occasional shaking, 50 c.c. are pipetted off, a few drops of phenolphthalein are added, and the liquid is boiled until a pink colour appears or until the volume is reduced to 5 c.c. Then with two portions of treated soil, one of which has been rendered alkaline by the lime-water and the other is still acid, as guides, three fresh portions of 10 grams each are taken and treated with lime-water as before, except that the amount added to a dish differs from that added to another by 1 or 2 c.c. The dried residue is then treated as directed. The smallest amount of lime-water, which still gives a decided pink colour, is taken to represent the acidity of the soil. L. de K.

General and Physical Chemistry.

Ultra-red Absorption Spectra of Organic Liquids. Max Iklé (*Chem. Centr.*, 1904, ii, 15; from *Physikal. Zeit.*, 5, 271—277).—The liquids were contained between parallel plates of fluorspar separated by a glass ring, special precautions being taken to prevent evaporation. The spectrum was obtained by means of a fluorite prism and zirconium light. The following groups of compounds were examined: (1) methylene chloride, chloroform, carbon tetrachloride; (2) methyl iodide, methylene iodide; (3) ethyl alcohol, ethyl bromide; and (4) ethyl alcohol and ethyl iodide. The results showed that the replacement of hydrogen or hydroxyl by a halogen increases the diathermancy of the liquid for all portions of the ultra-red spectrum, the effect, as a rule, being most marked for wave-lengths of the least diathermancy. The ultra-red absorption spectra of isomeric liquids did not show any general characteristics or relationship. All the compounds were least diathermanous for wave-lengths of 3435—3240 $\mu\mu$. Julius found that hydrocarbons also showed the same minimum, and attributed the phenomenon to the presence of the radicle C_nH_{2n+1}. Since carbon disulphide, however, behaves in the same way, the cause is possibly to be found in the carbon atom itself. Most compounds also give minima at 5—5·2 μ, whilst others show different characteristic minima. Maxwell's law does not hold for any of the liquids examined.

E. W. W.

The Spectrum of Calcium Fluoride in the Electric Arc. Charles Fabry (*Compt. rend.*, 1904, 138, 1581—1584).—When an electric arc is formed between cups containing calcium, strontium, or barium fluoride, there is formed, in addition to the spectrum of the metal, a very brilliant band spectrum due to the existence of the vaporised salt incompletely dissociated. In the case of calcium fluoride, the bands belong to two different types, but have common characteristics. All the bands are represented by the equation $N = B - Am^2$, where N is the inverse of the wave-length in a vacuum, and m a whole number which is greater than a certain limit in one type, and less than a certain limit in the other.

M. A. W.

[Phosphorescence of] Kunzite. Charles Baskerville and George F. Kunz (*Amer. J. Sci.*, 1904, [iv], 18, 25—28).—Kunzite, the new variety of spodumene, becomes luminescent when heated, but not when rubbed. An oscillating electric current, ultra-violet rays, Röntgen rays, and the emanations of radium and actinium all produce a brilliant orange-pink glow, which persists for some time after the exciting cause has been withdrawn. In its behaviour in this respect, kunzite differs from the hiddenite variety of spodumene, as well as from all other minerals.

L. J. S.

Emanations and Radiations. Marcellin Berthelot (*Compt. rend.*, 1904, 138, 1553—1555).—The author urges the importance of exact analyses of emanations before definite hypotheses regarding their nature are advanced.

M. A. W.

Influence of Changes of Temperature on Radioactive Substances. Stefan Meyer and Egon R. von Schweidler (*Chem. Centr.*, 1904, ii, 78; from *Physikal. Zeit.*, 5, 319—320).—Measurements of the velocity of discharge, made by means of an Elster-Geitel electroscope, have shown that in the case of uranium, uranium nitrate crystals, uranium nitrate solution, pitchblende, polonium, and radium, the velocity decreases with rise of temperature. This effect can only be explained by assuming that the activity is merely temporarily affected; the emanations may be increased, and the discharging power consequently decreased. In the case of radium and pitchblende, the activity of the β-rays is the most affected, whilst radiotellurium, which emits α-rays, is the least influenced by change of temperature.

E. W. W.

Action of Magnetic or Electric Forces on the Ponderable Emanation; Displacement of this Emanation by Air in Motion. R. Blondlot (*Compt. rend.*, 1904, 138, 1676—1679. Compare this vol., ii, 531).—Two similar bar magnets, encased in lead foil and in glass vessels, are placed parallel to one another on a table at a distance of 6 cm., the N pole of one being adjacent to the S pole of the other and projecting over the edge of the table; a 5 franc piece is placed just above the NS field thus formed, and the space below is explored by means of a small phosphorescent screen, with the results that in the absence of the magnets the emanation from the coin falls vertically, whilst in the presence of the magnets it is separated into three parts, one falling vertically, and two others equally inclined to the vertical on each side. Of these two latter, one is repelled by a negatively, and the other by a positively electrified body. These facts are readily explained on the assumption that the emanation from the coin consists of three kinds of particles, non-electrified, positively, and negatively electrified respectively. A current of air has the effect of diverting the path of the emanation. The emanation has an effect similar to that of the n-rays on a small electric spark.

M. A. W.

Action of Anæsthetics on the Sources of n-Rays (*Compt. rend.*, 1904, 138, 1159—1161). **Simultaneous Emission of n- and n_1-Rays** (*ibid.*, 1332—1335). **The Anæsthesia of Metals** (*ibid.*, 1415—1418). **Contribution to the Study of n- and n_1-Rays** (*ibid.*, 1486—1489). **Action of a Magnetic Field on n- and n_1-Rays** (*ibid.*, 1586—1589). **Comparable Effects of β-Rays and n-Rays, or of α-Rays and n_1-Rays, on a Phosphorescent Surface.** Jean Becquerel (*Compt. rend.*, 1904, 139, 40—42).—According to the author's hypothesis, the cause of the Blondlot rays is to be found in the molecular vibration set up in a substance which becomes a source of n- or n_1-rays when it suffers compression or expansion respectively; the vibratory movement gives rise to perturbations of the ether analogous to light, which have the power of transmitting to a surface capable of absorbing them (for example, calcium sulphide, metals, &c.) the mechanical effect to which they owe their origin, these surfaces thereby becoming secondary sources of similar rays. The simultaneous emission of n-rays normally, and n_1-rays tangentially, by the same substance is probably due to the mechanical deformation of the substance setting up a contraction in one direction and an expansion in another, for if a prism or cylinder is compressed in the direction of its axis it expands in a direction at right angles, and whilst n-rays are emitted normally to the base, n_1-rays arise tangentially; further, Prince Rupert drops are elongated in the direction of their length and contracted normally to their surface; they form therefore a powerful source of n- or n_1-rays according as the rays issuing normally to the surface or from the point are under investigation.

The power of emitting Blondlot rays is suspended by the action of alcohol or such anæsthetics as chloroform, ether, or nitrogen monoxide (compare Meyer, *Compt. rend.*, 1904, **138**, 101), and metals which are normally transparent to the rays become opaque in the vapour of the same substances.

The undulatory movement, analogous to light waves, is not, however, the only element of the Blondlot rays; there is, in addition, an "emanation" capable of being deflected in a magnetic field in the same manner as the β-rays of radium bromide or a uranium salt. Further, the β-rays of a radioactive substance produce on a calcium sulphide screen an exactly similar effect to that produced by a source of n-rays, whilst the α-rays of poloniferous bismuth oxide have the same effect as n_1-rays. M. A. W.

Influence of the Colours of Luminous Sources on their Sensitiveness to n-Rays. C. Gutton (*Compt. rend.*, 1904, **138**, 1592—1593).—The author finds that when a ground glass screen is illuminated with simple colours obtained spectroscopically and exposed to a source of n-rays, it becomes more luminous when the colour of the light is violet or blue, slightly more luminous when the colour is green, whilst for yellow, red, or orange light there is no effect. This explains why calcium sulphide, with a violet phosphorescence, is more sensitive to the action of n-rays than the sulphides of the alkali earths and of zinc, which have a green or orange phosphorescence.

M. A. W.

A Photographic Method of Studying the Action of n-Rays on Phosphorescence. E. Rothé (*Compt. rend.*, 1904, **138**, 1589—1591).—The author describes a photographic method of rendering objective the effect of n-rays on a phosphorescent calcium sulphide screen. The method consists in taking a series of photographic impressions of a small, circular phosphorescent calcium sulphide screen at equal intervals of 20 seconds, the distance between the screen and the photographic plate being about 5 mm.; a curve constructed with the time intervals as abscissæ, and the diameters of the black spots which constitute the photographic impressions as ordinates, is quite regular and represents the normal diminution of the phosphorescence with time. If, however, a similar series of photographic impressions are taken, the screen being subjected periodically to the action of heat rays or n- or n_1-rays, which tend to increase or diminish the phosphorescence, the curve ceases to be regular, and the breaks in a curve so obtained can be taken as evidence of the presence of some perturbing source. M. A. W.

Improvements in the Photographic Method for Recording the Action of n-Rays on a Small Electric Spark. R. Blondlot (*Compt. rend.*, 1904, **138**, 1675—1676).—The author has previously described in detail a method for recording photographically the effect of n-rays on a small electric spark (compare *Compt. rend.*, 1904, **138**, 453—456). In the present paper, a few improvements on the method are suggested, relating chiefly to the concentration of the n-rays by means of an aluminium lens. M. A. W.

A New Method of Observing n-Rays and Analogous Agents. R. Blondlot (*Compt. rend*, 1904, **139**, 114—115).—The difficulty and fatigue attending the observation of n-rays and ponderable emanations (compare this vol., ii, 531, 602) by observing a change in the brightness of a phosphorescent ray on a dark surface is obviated by the following device: the calcium sulphide is deposited in the form of a band 0·001 to 0·002 metre wide, and 0·02 to 0·03 metre long, on a piece of white grained cardboard which is illuminated with a yellow light of such intensity that it forms with the blue phosphorescence of the calcium sulphide an almost white light which cannot be distinguished from the yellow light of the rest of the cardboard; if now a source of n-rays or an analogous agent be brought near the screen, the blue phosphorescence of the calcium sulphide is immediately visible; and, conversely, if the blue phosphorescence is just visible, the action of n_1-rays causes it to disappear. M. A. W.

Dielectric Cohesion of Saturated Mercury Vapour and its Mixtures. E. Bouty (*Compt. rend.*, 1904, **138**, 1691—1692. Compare this vol., ii, 309).—In view of the high density of mercury vapour, its dielectric cohesion is very small, being only 0·85 of that of air, and the addition of other gases, such as carbon dioxide or hydrogen, causes a marked increase in the value; in these respects mercury resembles argon. The dielectric cohesion of a mixture of the two monatomic gases, mercury vapour and argon, however, is very much greater than the calculated value, showing that mercury has the same effect as the polyatomic gases in increasing the dielectric cohesion of argon. M. A. W.

Electrical Resistance of Lead Peroxide. Franz Streintz (*Zeit. Elektrochem.*, 1904, **10**, 414—415).—A bar of lead peroxide formed by compressing the powdered substance always contains small cracks which increase its electrical resistance.

A more serious error is due to transition resistances between the lead peroxide and the metallic terminals. In a measurement the details of which are given, the transition resistances amounted to nearly three-quarters of the apparent resistance of the bar.

The transition resistance between lead and lead peroxide is especially large, hence Ferchland's result (*Zeit. Elektrochem.*, 1903, 9, 670) is probably much too high. The author regards his own result (specific resistance = 0·000223 ohm) (Abstr., 1903, ii, 127) as an upper limit.

T. E.

Electrolysis with Rapidly Moving Electrodes. HENRY SAND (*Zeit. Elektrochem.*, 1904, **10**, 452—454).—With reference to Amberg's paper on the advantages of rotating electrodes in electrolytic analysis (this vol., ii, 593), the author points out that the theoretical explanation of these advantages is contained in his paper on the electrolysis of solutions of copper sulphate (Abstr., 1901, ii, 82). The rapid circulation of the liquid keeps up the supply of ions at the electrodes and so permits a metal to be deposited much faster than would be the case if diffusion alone were depended on. T. E.

Heat of Transformation of Black Crystallised Antimony Sulphide into the Orange Precipitated Sulphide. MARCELLIN BERTHELOT (*Compt. rend.*, 1904, **139**, 97—98).—A reply to Guinchant and Chrétien (compare this vol., ii, 568). The author maintains his original conclusion (compare *Ann. Chim. Phys.*, 1887, [vi], **10**, 136) that for dilute solutions and constant temperatures the heat of conversion of black crystallised antimony sulphide into the orange variety is nil. M. A. W.

Thermochemical Studies. DANIEL LAGERLÖF (*J. pr. Chem.*, 1904, [ii], **69**, 513—544. Compare this vol., ii, 382).—A continuation of the author's criticism of Thomsen's theory of the heat of formation of carbon compounds. G. Y.

Heat of Combustion of Organic Compounds. JULIUS THOMSEN (*Zeit. anorg. Chem.*, 1904, **40**, 185—195).—A criticism of Lemoult's results (Abstr., 1903, ii, 410; this vol., ii, 12, 310). The theory respecting the heat of combustion of hydrocarbons advanced by Lemoult, namely, that the heat of combustion of a hydrocarbon is dependent only on the number of hydrogen atoms contained in the molecule of the hydrocarbon and on the number of linkings between the carbon atoms in the molecule, is not a new contribution to the theory of the heat of combustion of organic compounds. The chief error made by Lemoult consists in his calculating the heat of combustion of any particular hydrocarbon irrespective of whether the hydrocarbon in question is solid, liquid, or gaseous. The constants for hydrocarbons in the solid or liquid forms are always greater than those for hydrocarbons in the gaseous form. Many of the values quoted by Lemoult are very inaccurate. A. McK.

Heat of Combustion of Organic Compounds containing Sulphur. Remarks relating to Halogen Compounds. PAUL LEMOULT (*Compt. rend.*, 1904, **139**, 131—134. Compare Abstr., 1903, ii, 410; this vol., ii, 12, 310, 382).—The heat of combustion of the compound $C_xH_{y-a}(N_mH_a)O_pS_n$, as calculated from the expression $102x + 55/2y + (16{\cdot}5m - 10a) - \Sigma p\phi + 151n$, the value of ϕ varying with state of combination of the oxygen in the molecule, agrees closely with the experimental value. The heats of combustion of organic compounds containing halogens can be calculated from the general formula given above, making the correction of $-15{\cdot}5$ Cal. for each atom of chlorine, $-0{\cdot}5$ Cal. for each atom of bromine, or $9{\cdot}5$ Cal. for each atom of iodine. M. A. W.

Heat of Vaporisation of Aniline. WLADIMIR F. LUGININ (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 672—679).—The author replies to the criticisms of Kurbatoff (compare Abstr., 1903, i, 246), who obtained values 2½ per cent. greater than that given by the author (Abstr., 1901, ii, 145; 1903, ii, 7) for the heat of evaporation of aniline. Further measurements of this magnitude yield the values 104·09, 103·57, and 104·49, having the mean 104·04, which agrees well with the number (104·0) previously given by the author (*loc. cit.*).

T. H. P.

The Molecular Volume of Solid Compounds and the Relation of the Osmotic Pressure to the Depression of the Freezing Point and the Raising of the Boiling Point of Solutions. WILHELM VAUBEL (*J. pr. Chem.*, 1904, [ii], 69, 545—559. Compare Traube, Abstr., 1896, ii, 153; Longinescu, this vol., ii, 112).—The author shows that for 18 liquids, the boiling point of any solvent is raised to approximately the same extent for one gram-molecule of solute per gram-molecule of solvent. This effect is calculated, in terms of heat, from the relation $E = 3{\cdot}15C_L(m + m_1)$ cal., where m and m_1 are the gram-molecules of solute and solvent respectively and C_L is the specific heat of the solution.

The depression of the freezing point (15 solvents) due to one gram-molecule of solute per gram-molecule of solvent varies from 105 for water to 17·2 for palmitic acid. As, in the series of fatty acids, the tendency to form large molecules diminishes as the carbon chain increases, palmitic acid may be considered to be unassociated, in which case 17·2 is the true molecular depression. The state of aggregation of other solvents, in the solid state, is found by dividing the observed molecular depression by 17·2. Thus the solid molecule of water, $105/17{\cdot}2 = 6{\cdot}1$, is $(H_2O)_6$. The heat rendered latent by the solution of one gram-molecule of solute per gram-molecule of solvent is

$$17{\cdot}2, C_L(m + m_1) \text{ cal.}$$

When a substance is dissolved in water, it enters into reaction with the complex $(H_2O)_6$, forming $(H_2O)_5M$, and setting $1H_2O$ free. This molecule of water, acting as a gas molecule, produces the effect of osmotic pressure, which approximates to the pressure equivalent to the rise in the boiling point. The depression of the freezing point of a solution is due to the molecule dissolved as well as to the water molecule set at liberty; the raising of the boiling point is an effect of the latter only. The energy rendered latent by solution of a substance near the freezing point of the solvent is equivalent to a pressure of 227·6 atmospheres, that at the boiling point to 63 atmospheres.

G. Y.

Internal Friction of Solutions. GEORGE RUDORF (*Zeit. Elektrochem.*, 1904, 10, 473—474).—In a previous paper (Abstr., 1903, ii, 404) the author found that carbamide lowers the internal friction of water. Fawsitt (this vol., ii, 323) has failed to confirm this result. Rudorf now states that his experiments were made with a coiled capillary tube, the shape of which caused the results to be affected by a systematic error. Fawsitt's results agree with the formula $\eta = 1 + an$ for fairly dilute solutions. Some experiments on solutions of two substances are in agreement with Fawsitt's rule that the internal friction of a solution of several substances is equal to the product of the frictions of the solutions of the single substances. T. E.

Velocity of Reaction in Aqueous Solutions near the Point of Maximum Density. ANTONIO QUARTAROLI (*Gazzetta*, 1904, 34, i, 505—516).—The author has measured the velocities of hydrolysis of methyl and ethyl acetates by sodium hydroxide, first at low temperatures and for small intervals of temperature, and then after having artificially lowered the point of maximum density of the water by the addition of methyl or ethyl alcohol. The results show that none of the formulæ suggested for expressing the variation of the velocity of reaction with the temperature represents satisfactorily the changes in the velocity of hydrolysis of methyl and ethyl acetates in aqueous solution between 10° and 0°, whilst the changes at higher temperatures or in solutions containing more than 10 per cent. of methyl or ethyl alcohol are expressed moderately well by these formulæ. T. H. P.

Order of Magnitude of the Time of Formation of Complex Molecules, Equilibrium Constants, and Atomic Dimensions. FRITZ HABER (*Zeit. Elektrochem.*, 1904, 10, 433—436).—The concentrations of ions in solutions, calculated from measurements of *E.M.F.*, are often very small. Assuming the dimensions of an atom given by the kinetic theory, the author calculates, for example, that a certain solution containing $Ag(CN)_3''$ ions contains only 8 silver ions in a litre.

Ostwald has suggested that the equilibrium constant is to be interpreted as the ratio between the times which a silver atom passes in the ionic condition and in the condition of a complex ion. This is the same thing as the ratio between the times required to form a molecule of the complex ion from, and the time required to decompose it into, its constituent ions. Since all the silver can be precipitated (by a metal or electrolytically) from the solution under consideration in a short time, it follows that the time required to decompose the complex ion is small; from the equilibrium constant, it is seen that the time required for the combination of $Ag^{\cdot}$ and $(CN)'$ ions is 10^{22} times smaller. Supposing that the combination merely required the passage of electricity across a space of atomic dimensions with the velocity of light, the time required would be at least 10^{-18} second.

If ponderable matter has to move, it is much greater. It appears, therefore, that Ostwald's suggestion leads to the assumption of reaction velocities thousands or millions of times greater than the greatest conceivable on the atomic hypothesis.

The author points out that the small ionic concentrations calculated are not necessarily realities. The potential of an electrode is determined by the reaction taking place at it, and this depends on the well-defined concentrations of the ions present in large quantity. For a silver electrode immersed in a solution containing $Ag^{\cdot}$, $Ag(CN)_3''$, and $(CN)'$ ions, the reaction is $Ag + 3(CN)' + F \rightleftarrows Ag(CN)_3''$, and not necessarily $Ag + F \rightleftarrows Ag^{\cdot}$. T. E.

Systems containing Silicic and Hydrofluoric Acids. EMIL BAUR (*Zeit. physikal. Chem.*, 1904, 48, 483—503. Compare this vol., ii, 119).—As a preliminary to a dynamical study of the reaction between water and silicon fluoride, the vapour density of hydrofluosilicic acid has been determined at 23°, 31·5°, and 42°, and under pressures between 650 and 1350 mm. Hg. The molecular weight indicated under these conditions lies between 80 and 83, showing that hydrofluosilicic acid is probably dissociated to the extent of two-thirds or thereby (compare Thorpe and Hambly, Trans., 1889, 55, 163).

With the equilibrium between silicon fluoride, hydrofluoric acid, water, and silicic acid, the composition of the vapour given off from a dilute solution of hydrofluosilicic acid containing free silicic acid is closely allied. When a 13·3 per cent. solution of hydrofluosilicic acid in water is boiled under a pressure of 720 mm., the vapour contains the molecules HF and SiF_4 in the numerical ratio 2 : 1. The vapour given off on boiling a more concentrated solution contains relatively more silicon fluoride, that from a more dilute solution contains relatively more hydrofluoric acid. The equilibrium constant of the reaction $SiO_2 + 4HF = SiF_4 + 2H_2O$ has been determined at 104° and 270° and found to have the respective values 163×10^7 and 540×10^5. From these numbers, it follows that the equilibrium point of the foregoing reaction shifts to the left with rising temperature. Hence the formation of silicon fluoride and water from silicic and hydrofluoric acids is accompanied by the evolution of heat, and from the equation $d(\log_e K)/dT = q/RT^2$, the heat evolution q is calculated to be 8945 cal. This is only about one-third of the value calculated from thermochemical data, but the latter are probably inaccurate. J. C. P.

Reduction of Nitro-compounds by Stannous Haloids. HEINRICH GOLDSCHMIDT and KRISTIAN INGEBRECHTSEN (*Zeit. physikal. Chem.*, 1904, 48, 435—466).—A quantitative study has been made (1) of the reducing action of stannous chloride and hydrochloric acid on *m*-nitrobenzenesulphonic acid, *p*-nitrotoluenesulphonic acid, *o*- and *m*-nitrobenzoic acids, *o*-, *m*-, and *p*-nitroanilines, 3-nitro-4-toluidine, 2-nitro-4-toluidine, 4-nitro-2-toluidine, 5-nitro-2-toluidine, 6-nitro-2-toluidine; (2) of the reducing action of stannous bromide and hydrobromic acid on *m*-nitrobenzenesulphonic acid, *m*-nitrobenzoic acid, 2-nitro-4-toluidine, *p*-nitrophenol. Series of experiments in which the acid concentration remained the same showed that so far as the stannous salt and the nitro-compound are concerned the reaction is of the second order. This means that a nitroso-compound is primarily formed, which is then further reduced with very great velocity. It can indeed be shown that a nitroso-compound is reduced practically instantaneously by acid stannous chloride. When the reduction of a nitro-compound in presence of varying amounts of hydrochloric acid is studied, it is found that the rate of change is directly proportional to the concentration of the acid. The authors consider that the only way of interpreting this result is to adopt Young's view (Abstr., 1901, ii, 318; compare Noyes, Abstr., 1902, ii, 498) that an acid solution of stannous chloride contains the complex $SnCl_3H$, with its ions $H^{\cdot}$ and $SnCl_3'$. On the supposition that the ion $SnCl_3'$ is the active agent in the reduction, it is possible to formulate satisfactorily the course of the change. The governing equation is thus found to be $dx/dt = k(a-x)(b-x)(c-x)$, where a, b, and c are the initial concentrations of nitro-compound, stannous chloride, and hydrochloric acid respectively. Hence, if c is large compared with a and b, the reaction is of the second order, in agreement with the experiments. Although the potential difference $Pt \mid SnCl_2,HCl$ is practically the same as the potential difference $Pt \mid SnBr_2,HBr$, the velocity constant of reduction with stannous bromide and hydrobromic acid is 8 times as great as that with stannous chloride and hydrochloric acid. This is to be attributed to the different oxidisability of the ions $SnBr_3'$ and $SnCl_3'$, or to the different equilibrium between these ions and their corresponding molecular complexes. Whether the chloride or bromide is used as the reducing agent, a rise of 10° means a doubling of the velocity constant.

The effect of hydrochloric acid on the reduction appears to be exceptional in the case of *o*-nitroaniline and 3-nitro-4-toluidine, but this is to be attributed to the relative weakness of nitrated aromatic bases, in which the nitro-group occupies the ortho-position relatively to the amino-group (compare Loewenherz, Abstr., 1898, ii, 326). Special consideration of these two cases makes it probable that in the case of the nitro-bases it is the positive basic ions that are primarily involved in the reaction.

When the rates of reduction of isomeric compounds are compared, it is found that the velocity is greatest for the orthonitro-compound; this rule holds only when the nitro-group occupies the ortho-position relatively to the characteristic group (CO_2H,NH_2) of the compound, but not when the nitro- and methyl groups are next each other. In general, the velocity of reduction of a nitro-compound is diminished by the introduction of a methyl group. J. C. P.

Catalytic Action of Metallic Chlorides. Heinrich Goldschmidt and Halfdan Larsen (*Zeit. physikal. Chem.*, 1904, 48, 424—434. Compare Bruner, Abstr., 1902, ii, 447; Slator, Trans., 1903, 83, 729).—The influence of stannic chloride and aluminium chloride on the rate of chlorination of nitrobenzene has been studied quantitatively. Solutions of chlorine in nitrobenzene and of the metallic chloride in nitrobenzene were mixed and kept in a bath at a suitable temperature, the amount of free chlorine being determined from time to time by adding a known quantity of the mixture to excess of potassium iodide solution. For a given quantity of catalytic agent, the course of the chlorination is that of a unimolecular reaction. The rate of change is proportional to the concentration C of the catalytic agent, and is therefore expressed by the equation $dx/dt = K.C(a-x)$. At 50°, K, for stannic chloride, $=0{\cdot}000778$, for aluminium chloride $K = 0{\cdot}0239$, so that the chlorination of nitrobenzene takes place 31 times more rapidly in the presence of aluminium chloride than in that of stannic chloride. Over the temperature range 50—100°, the velocity constant at $T+10$ is 1·35 times that at T. Comparative experiments show that ferric chloride is still more effective than aluminium chloride. Antimony and phosphorus pentachlorides and arsenic trichloride exert practically no catalytic action.

Friedel and Craft's reaction also has been studied quantitatively, and in particular the interaction of benzyl chloride, anisole, and aluminium chloride. The course of the reaction was followed by extracting the unchanged benzyl chloride, hydrolysing with alcoholic soda, and titrating with silver nitrate. Experiments at 25°, 15·2°, and 0° show that the reaction between anisole and benzyl chloride is of the first order, and that the rate of change is proportional to the concentration of the aluminium chloride. For a rise of 10°, the velocity coefficient is nearly doubled. J. C. P.

Passivity of Metals. Wolf Johannes Müller (*Zeit. physikal. Chem.*, 1904, **48**, 577—584).—When the conception of electrons is applied to the phenomena of passivity, it becomes probable that Schönbein's view is correct, and that the explanation which refers the passivity to the presence of a non-metallic layer is incorrect. It also follows that every metal which can form ions of more than one valency should exhibit activity or passivity under suitable conditions. The behaviour of chromium, lead, and iron is completely in harmony with this view, as is also the behaviour of platinum under the action of an alternating current (compare Ruer, *ibid.*, 1900, **34**, 81).

J. C. P.

Spontaneous Crystallisation of Supercooled Liquids. Christian Füchtbauer (*Zeit. physikal. Chem.*, 1904, **48**, 549—568).—Partly a theoretical paper on the limits of stability of supercooled liquids.

In the case of liquids dissolved in liquids, supersaturation is impossible, and this appears to be conditioned by the presence of dust particles. That these are immediately effective in preventing supersaturation in liquids, but effective only after a certain degree of supersaturation in the case of crystalline substances, indicates that these dust particles are amorphous, and consist probably of some widely distributed colloid (say silica). J. C. P.

Crystallisation of Glassy Masses. W. Guertler (*Zeit. anorg. Chem.*, 1904, **40**, 268—279).—Tammann has shown that a large number of substances can be supercooled and retained in an unstable, amorphous condition if the range of temperature of maximum spontaneous crystallisation and maximum rate of crystallisation is quickly passed through.

Sodium silicate, Na_2SiO_3, cobalt pyroborate, $Co_2B_2O_5$, copper metaborate, CuB_2O_4, and manganese diborate, MnB_4O_7, when melted and quickly cooled, solidify to a clear glass. Such glasses were gradually heated, the temperature being measured by a Le Chatelier thermo-element, and the temperatures noted at which the crystallisation took place. The crystallisation in each case was, of course, accompanied by a considerable rise of temperature. The results are represented by curves.

The temperature at which crystallisation begins is independent of the rate of heating; this is shown most clearly in the experiments with sodium metasilicate. A. McK.

Velocity of Crystallisation of Fused Liquid Mixtures. Friedrich Dreyer (*Zeit. physikal. Chem.*, 1904, **48**, 467—482).—It has been shown by Tammann and others that when the velocity of crystallisation is plotted against the bath temperature the curve obtained has a rising branch, a maximum, and then a falling branch, as the temperature is lowered. The author shows that at temperatures corresponding with the falling portion of the curve the velocity of crystallisation of formanilide is sometimes increased, sometimes diminished, by the addition of other substances. On the rising branch of the curve, addition of other substances invariably leads to a diminution of the velocity of crystallisation, a diminution which cannot be entirely accounted for by the lower temperature prevailing at the crystallising face. As the concentration of the added substance increases, so the maximum of the above-mentioned curve for formanilide shifts to lower temperatures. J. C. P.

Excelsior Condenser. Excelsior Distillation Column. Henri Vigreux (*Chem. Zeit.*, 1904, **28**, 686).—In the condenser described, the inner tube has a series of indentations lying closely together and each carried nearly across the tube, so that there is a large condensing surface. In a condenser 30 cm. long, the vapour from ½ litre of ether in rapid ebullition is completely condensed. At the same time, any moisture carried mechanically to the condenser tube is prevented from passing on.

A fractionating column on the same principle is described and illustrated. A. McK.

New Wash-bottle. Eduard Kob (*Chem. Zeit.*, 1904, **28**, 687).—In the arrangement described, instead of the doubly-perforated cork of the ordinary wash-bottle, only one perforation of the cork is necessary, since the tube passing through it to the bottom of the flask is partitioned, and one side connected with the outlet, the other with the inlet tube. A. McK.

Black Coating Resisting Acids and Alkalis. Ferdinand Jean (*Ann. Chim. anal.*, 1904, **9**, 258).—Laboratory benches, &c., are treated three times in succession with (1) solution of 150 grams of aniline hydrochloride per litre, (2) a solution containing 86 grams of cupric chloride, 77 grams of potassium chlorate, and 33 grams of ammonium chloride per litre.

After 8 days, a coating of linseed oil is put on. L. DE K.

Inorganic Chemistry.

Hypochlorous Acid. Electromotive Behaviour. WALTHER NERNST and JULIUS SAND (*Zeit. physikal. Chem.*, 1904, **48**, 601—609).—With the help of Jakowkin's study of the equilibrium between chlorine and water, it is possible to calculate the potential difference between a platinum electrode and solutions containing hypochlorous acid or hypochlorites. When the concentration of the hypochlorous acid is not too small, there is exact agreement between theory and experiment, and the platinum electrode is apparently polarised by the oxygen produced in the primary decomposition of the HClO molecule. In this and kindred investigations it is necessary to make sure that the substance which is primarily responsible for the polarisation of the electrode is present in sufficient concentration. Other analogous cases are furnished by the polarisation of platinum in ozone and nitric acid solutions. J. C. P.

Strength of Hypochlorous Acid. JULIUS SAND (*Zeit. physikal. Chem.*, 1904, **48**, 610—614).—A solution of sodium hypochlorite absorbs more carbon dioxide than pure water at the same temperature, and from the amount of this excess it is possible, when the dissociation constant of carbonic acid (Walker, Abstr., 1900, 268) is taken into account, to calculate the dissociation constant of hypochlorous acid. The value found, which is probably a little too high, is $3{\cdot}7 \times 10^{-8}$ at 17°. J. C. P.

Densities of Sulphur Dioxide and Oxygen. ADRIEN JAQUEROD and ALEXANDRE PINTZA (*Compt. rend.*, 1904, **139**, 129—131).—The authors have determined the densities of sulphur dioxide and oxygen by means of the method used by Morley in determining the density of hydrogen (compare Abstr., 1895, ii, 261; 1896, ii, 595); a large vessel of known volume connected with a manometer was filled with the gas liberated from a small piece of apparatus, which was weighed before and after the experiment. In the case of oxygen, the gas was obtained by electrically heating potassium permanganate, whilst the sulphur dioxide was obtained from the liquid by lowering the pressure. The weight of a normal litre of oxygen as found by this method was 1·4292 grams with a maximum error of 1/3000, and the corresponding value for sulphur dioxide was 2·92664 grams with a maximum error of 1/10000; Leduc found 2·9267 (compare Abstr., 1893, ii, 516). The weight of a litre of sulphur dioxide at 0° under 570 mm. pressure was found to be 2·18172 grams, and under 380 mm. pressure 1·44572 grams. M. A. W.

Action of Hydrogen Peroxide on Tellurium Dioxide. A New Method for the Preparation of Telluric Acid. Alexander Gutbier and W. Wagenknecht (*Zeit. anorg. Chem.*, 1904, **40**, 260—263).—Potassium tellurate is produced when a 15 per cent. solution of hydrogen peroxide acts on a mixture of potassium hydroxide and tellurium dioxide at 60—70°. When the solution is acidified by sulphuric acid, telluric acid is precipitated and may be obtained free from potassium salts. Sodium hydroxide solution may be substituted for potassium hydroxide.

The telluric acid obtained was identified by analysis and by the following reactions. When boiled with hydrochloric acid, it evolved chlorine, a reaction characteristic of sexavalent tellurium. When heated in an ignition tube, water was evolved, the residue becoming orange-yellow and then melting to a white mass, which was soluble in hydrochloric acid to an amber-yellow solution. The silver and sodium salts were also prepared. A. McK.

Behaviour of Telluric Acid during Electrolysis. A New Modification of Colloidal Tellurium. Alexander Gutbier and F. Resenscheck (*Zeit. anorg. Chem.*, 1904, **40**, 264—267).—When an aqueous solution of telluric acid containing potassium cyanide is electrolysed with a current of 0·5 ampere, the solution gradually becomes brownish-violet owing to the formation of tellurium in the hydrosol form; as the electrolysis is continued, the tellurium separates as a flocculent precipitate. When ammonium oxalate is substituted for potassium cyanide, the steel-blue hydrosol of tellurium is first of all formed. By dialysis, the new brownish-violet hydrosol form may be obtained in brilliantly-coloured solutions, which are not decomposed after six months. A. McK.

Reaction between Nitric Oxide and Oxygen at Low Temperatures. Luigi Francesconi and N. Sciacca (*Gazzetta*, 1904, **34**, i, 447—457).—The authors have made a number of experiments on the influence of temperature on the reaction between nitric oxide and oxygen, on the conditions under which the nitrous anhydride and nitrogen peroxide formed pass into one another under the action of nitric oxide or oxygen, and on the stability of nitrogen trioxide. The results arrived at are briefly as follows: (1) liquid nitric oxide and oxygen or gaseous oxygen and liquid or solid nitric oxide, or gaseous nitric oxide and liquid oxygen, mixed in all proportions, even with the oxygen in large excess, always yield nitrogen trioxide. (2) Gaseous nitric oxide and oxygen, the latter being in excess, also give nitrogen trioxide if they react at a temperature lower than $-110°$. (3) When subjected to the action of oxygen, nitrogen trioxide is transformed into nitrogen peroxide only at temperatures above $-100°$. (4) The reduction of nitrogen peroxide to nitrogen trioxide by nitric oxide commences at $-150°$. (5) Nitrogen trioxide is stable under the ordinary pressure up to a temperature of $-21°$. T. H. P.

Properties of Mixtures of Nitric and Sulphuric Acids. III. A. V. Saposchnikoff (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 669—671. See this vol., ii, 251, 558).—The author has determined the sp. gr. and specific conductivities of mixtures in varying proportions of nitric acid of sp. gr. 1·48 and sulphuric acid. A very small addition (5 per cent.) of nitric acid increases the conductivity of sulphuric acid ten times; this is due to the presence in the nitric acid of water, which produces the same effect. T. H. P.

Preparation of Phosphorus Tribromide. Anastasios K. Christomanos (*Ber.*, 1904, 37, 2883).—Phosphorus tribromide is obtained (yield, 88 per cent.) by the action of bromine on yellow phosphorus under a layer of benzene. G. Y.

Limits of Miscibility of Boric Anhydride and Borates in the Fused Condition. W. Guertler (*Zeit. anorg. Chem.*, 1904, 40, 225—253).—Many metallic oxides, when melted with an excess of boric anhydride at temperatures up to 1400°, form two layers, the upper of which contains in most cases almost pure boric anhydride, whilst the lower contains the liquid borate together with an excess of boric anhydride. The lower layers can almost always be induced to crystallise, when the crystalline borates separate, and may be obtained pure by washing with water.

Oxides, which dissolve in fused boric anhydride, are divided into three classes. I. Those oxides which with fused boric anhydride yield clear, homogeneous molten masses, from which, on cooling, the oxide again separates, or clear glasses are produced. The oxides of lithium, potassium, sodium, rubidium, calcium, thallium and silver are included in this class. II. Those oxides which with fused boric anhydride also yield clear, homogeneous molten masses, but when cooled form an emulsion. The behaviour in this case is similar to that of partially miscible liquids, like phenol and water. For mixtures of lead monoxide and boric anhydride, the temperatures at which for different concentrations the formation of emulsion began were determined. To this group belong cuprous oxide, antimony trioxide, arsenic trioxide, titanium dioxide, the oxides of lead and bismuth, and molybdic, tungstic, and vanadic anhydrides. III. Oxides which form two layers with fused boric anhydride from the lower layer of which the borate can be separated. The metaborates of copper oxide, cerium oxide, neodymium oxide, praseodymium oxide, lanthanum oxide, gadolinium oxide, and samarium oxide, the pyroborates of magnesium oxide, cobaltous oxide, and nickelous oxide, and the diborates of calcium, strontium, and manganese were prepared by this method.

Burgess and Holt's results (Proc., 1903, 19, 221) are criticised.

A. McK.

Electrolytic Reduction of Carbon Dioxide. Alfred Coehn and Stefan Jahn (*Ber.*, 1904, 37, 2836—2842. Compare Royer, *Compt. rend.*, 1870, 70, 731).—Carbon dioxide is reduced electrolytically in aqueous sodium hydrogen carbonate, or, better, potassium sulphate solutions, but not in sodium carbonate or acid solutions. With most cathodes, reduction takes place to a small extent. With a cathode of zinc, freshly coated with zinc from a potassium cyanide bath, a 50 per cent. yield of formic acid is obtained. Repeated use of an amalgamated zinc cathode results at first in increased yields (up to 82 per cent.), but the cathode suddenly loses its activity. Amalgamated copper cathodes give constant yields (45—50 per cent.) on repeated use. After prolonged electrolysis of carbon dioxide in potassium sulphate solution, comparison of the acidity of the mixed cathode and anode solutions with the potassium permanganate titre shows the reduction to result in the formation of formic acid with little or no formaldehyde. Formic acid can also be obtained by electrolysis of an aqueous solution of carbon dioxide. G. Y.

Bell Process of Electrolysing Aqueous Solutions of Alkali Chlorides. G. ADOLPH (*Zeit. Elektrochem.*, 1904, 10, 449—450).—A claim for priority against Steiner (this vol., ii, 483). T. E.

Preparation of Sodium and Calcium Hyposulphites by Electrolysis. ALBERT R. FRANK (*Zeit. Elektrochem.*, 1904, 10, 450—452).—In reply to criticism by Elbs and Becker (this vol., ii, 556), the author states that in the preparation of solutions of sodium hyposulphite by electrolysis of solutions of sodium hydrogen sulphite it is necessary to use an almost neutral solution. The presence of free sulphurous acid liberates hyposulphurous acid, which readily decomposes. If this precaution is taken and the current density gradually increased, a good current efficiency can be maintained for a much longer time, and solutions containing 30 to 40 grams of hyposulphite per litre obtained.

Solutions of calcium hydrogen sulphite containing up to 90 grams of the salt per litre are employed in large quantities in the preparation of cellulose, and Elbs and Becker are mistaken in saying that the maximum solubility is 9·3 grams per litre. When a nearly neutral solution of calcium hydrogen sulphite containing from 40 to 60 grams of SO_2 per litre is electrolysed, the calcium hyposulphite soon begins to crystallise out in silky needles. From 30 to 40 per cent. of the weight of the calcium hydrogen sulphite used is obtained in the form of the solid hyposulphite, with a current efficiency of 60—70 per cent. The dry salt is unstable, about half of it being decomposed after three days' exposure to the air. T. E.

Behaviour of Borax towards Carbon Dioxide. LEO GRÜNHUT (*Zeit. physikal. Chem.*, 1904, 48, 569—576).—As shown by earlier workers, borax in aqueous solution is completely broken up into sodium metaborate and free boric acid. If carbon dioxide is passed through such a solution in the cold, the boric acid of the metaborate is also liberated and sodium hydrogen carbonate is produced. This has been established chiefly on the basis of conductivity experiments. If, after saturation with carbon dioxide, free boric acid is added in excess, a small quantity of metaborate is formed on account of mass action.

J. C. P.

Production of Isomorphous Mixtures of Lime and Lithia. Paul Lebeau (*Compt. rend.*, 1904, 138, 1602—1604. Compare this vol., ii, 561).—The double carbonate of lithium and calcium, obtained in the form of small, acicular crystals when a mixture of calcium carbonate (1 mol.) and lithium carbonate (2 mols.) is fused in an atmosphere of carbon dioxide and the product treated with a small quantity of water, is decomposed by excess of water, and when heated in a vacuum is dissociated, the dissociation pressure for any particular temperature being intermediate between those of the constituent salts. The product of complete dissociation is an isomorphous mixture of lime and lithia in the form of regular octahedral crystals, the composition of which varies with the temperature and duration of heating, as is represented in the following table:

Composition of original mixture.	Temperature of heating.	Duration of heating.	Composition of final product.
$CaO : 2·46\ Li_2O$	1200°	7 hours	$CaO : 0·24\ Li_2O$
$CaO : 2·36\ Li_2O$	1100	6 ,,	$CaO : 0·53\ Li_2O$
$CaO : 2·35\ Li_2O$	1350	4 ,,	$CaO : 0·16\ Li_2O$
$CaO : 1·61\ Li_2O$	1200	3 ,,	$CaO : 0·76\ Li_2O$

The formation of these mixed crystals of lime and lithia indicates that the crystals of the latter belong to the cubic system.

M. A. W.

The Presence of Chlorine in Barium Sulphate, precipitated by Barium Chloride. George A. Hulett and L. H. Duschak (*Zeit. anorg. Chem.*, 1904, 40, 196—217).—A method is described for estimating chlorine in barium sulphate, precipitated by barium chloride. The precipitate is dissolved in concentrated sulphuric acid and a current of purified air passed through the solution for two hours. In this manner, all the hydrogen chloride is expelled and estimated by being passed through an excess of $N/100$ silver nitrate solution. The amount of chlorine occluded in the barium sulphate precipitated by barium chloride may amount to as much as 1 per cent. and it is not possible to free the precipitate from it by washing. The amount of chlorine in the precipitate depends on the time the solution and precipitate have been agitated after precipitation; the longer the stirring, the more does the percentage of chlorine in the precipitate diminish. It is also noted that when barium sulphate is first precipitated it is very finely divided, but the particles increase in size as stirring goes on. The amount of chlorine in the precipitate does not depend on the surface of the latter. No proportionality was found between the concentration of the barium chloride solution and the amount of chlorine in the precipitate. When the precipitation by barium chloride was conducted with solutions containing varying amounts of hydrochloric acid, the amount of chlorine in the precipitate increased with the concentration of the hydrochloric acid, the concentration of the barium chloride being kept constant, but the increase observed was not proportional to the concentration of the hydrochloric acid.

The precipitate of barium sulphate (containing chlorine) undergoes no diminution in weight when dried below 300° ; a diminution occurs, however, when the temperature exceeds 325°, and proceeds until the temperature reaches 600°, when no further loss is observed. When the precipitate is heated in an ignition tube between 300° and red heat, it parts with water and hydrochloric acid, but all the chlorine in the precipitate cannot be removed in this manner. Even when the barium sulphate is precipitated from neutral or faintly alkaline solution, it still parts with water and hydrogen chloride when heated. The loss in weight of the precipitate at temperatures varying from 150° to 957° was determined. When the precipitate is heated at 700°, the residue contains only barium sulphate and barium chloride. Between 650° and 900°, the residue is neutral; from 900° onwards a perceptible amount of chlorine is lost and the residue becomes alkaline.

A. McK.

Distillation of Mixtures of Two Metals. Henri Moissan and Alphons O'Farrelley (*Compt. rend.*, 1904, **138**, 1659—1664).—By the use of the electric furnace (compare Abstr., 1893, ii, 507), binary mixtures of metals which do not form carbides at the temperature employed, such as copper, zinc, cadmium, lead, and tin, can be separated completely or partially by fractional distillation, the alloys behaving in this respect like the three well-known types of liquid mixtures. The more volatile metal is completely separated from alloys of copper and zinc or copper and cadmium after one or two minutes' heating. Alloys of copper and lead behave on distillation like a mixture of partially miscible liquids such as ether and water. Tin and lead alloys behave like a mixture of alcohol and water, the residue consisting of pure tin, whilst alloys of copper and tin behave like a mixture of formic acid and water, yielding an alloy of constant boiling point containing about 60 per cent. of tin.

M. A. W.

The Yellow and Red Varieties of Thallous Iodide, the Determination of the Normal Point of their Reciprocal Transformation. Désiré Gernez (*Compt. rend.*, 1904, **138**, 1695—1697).—The transition point of the two varieties of thallous iodide is 168°, and not 190° as stated by Hebberling (*Annalen*, 1865, **134**, 18); the new value was determined by very slowly raising the temperature of a tube containing a thin layer of the yellow iodide which was sown from time to time with a small crystal of the red variety; at temperatures above the transition point, the yellow becomes red, and if the mass is then very slowly cooled, the inverse change occurs at the transition point. The two varieties can, however, retain their individuality for a range of temperature from $-192°$ to $+200°$, the yellow variety becoming orange-coloured on heating at the higher temperature limit, and paler yellow on cooling to the lower limit, the red variety becoming a much deeper red on heating to near its fusion point, and a paler red on cooling in liquid air.

M. A. W.

Thallous Nitrate and Nitrite. U. Thomas (*Compt. rend.*, 1904, **138**, 1697—1699.)—When thallous nitrate is heated in a platinum tube, it melts without decomposition at 205°, decomposes slowly at 300°, and very rapidly at 450°, with the formation of nitrogen trioxide, thallium sesquioxide, and a small quantity of oxygen and nitrogen, due probably to the decomposition of a small quantity of the nitrate into nitrite and oxygen, and the subsequent decomposition of the unstable nitrite according to the equation $2TlNO_2 = Tl_2O + N_2 + 3O$. The thallium trioxide obtained by this reaction is in a crystalline form and has a sp. gr. 9·97; Lepièrre and Lachaud give 5·56 (compare Abstr., 1892, 568). A small quantity of the thallous nitrate sublimes unchanged. M. A. W.

Aluminium-magnesium and Aluminium-antimony Alloys. Hector Pécheux (*Compt. rend.*, 1904, 138, 1606—1607. Compare this vol., ii, 564).—The aluminium-magnesium alloys containing less than 65 per cent. of aluminium, described by Boudouard (compare Abstr., 1901, ii, 141, 512), were obtained by fusing the two metals in sealed tubes out of contact of air.

Aluminium-antimony Alloys.—Von Aubel has prepared an alloy SbAl, melting at 1080°, Guillet the alloys SbAl, $SbAl_3$, $SbAl_4$, and $SbAl_{10}$, and Gautier has examined the melting points of alloys of the two metals. The author has prepared the following new alloys melting between 730° and 760°: $SbAl_{30}$, sp. gr. 2·736 at 23°; $SbAl_{35}$, sp. gr. 2·700; $SbAl_{38}$, sp. gr. 2·662; $SbAl_{40}$, sp. gr. 2·598; which expand on solidifying, are slightly sonorous and brittle, and can be bent readily. They are stable in the air at the temperature of fusion, bluish-grey in colour, do not decompose water in the cold, but the alloy $SbAl_{30}$ decomposes water at 100°; they are attacked by concentrated hot sulphuric acid, by cold dilute sulphuric acid, by cold concentrated nitric or hydrochloric acid or aqua regia, and by cold concentrated potassium hydroxide solution. M. A. W.

Indium. I. Alfred Thiel (*Zeit. anorg. Chem.*, 1904, 40, 280—336. Compare this vol., ii, 177, 410).—In the historical introduction, reference is made to the work on indium of Reich and Richter, Böttger, Weselsky, Nilson and Pettersson, Renz, and more particularly of Winkler.

The crude material used was obtained partly from a by-product of lead manufacture in the Upper Harz, and partly as metal. The pure metal is best obtained by dissolving the crude metal in dilute nitric acid and submitting this solution to fractional electrolysis, full details of the separation of indium from other metals being quoted.

The conversion of indium into nitrate and then into oxide is not a satisfactory method for determining the atomic weight of indium. The experiments show that temperatures of from 800° to 850° are insufficient for the preparation of the pure oxide if considerable quantities of substance are dealt with.

The conversion of indium into its dichloride, trichloride, and tri-iodide are also unsatisfactory for atomic weight determinations.

The amount of chlorine in indium trichloride, purified by sublimation in the absence of air, was determined. The method was a practical one for determining the atomic weight of indium, the value found as a mean of four experiments being 115·05 ± 0·02($O = 16$). For details as to the precautions taken, the original paper may be consulted. The tribromide and tri-iodide gave unsatisfactory results.

Indium crystallises in octahedra; it is a very soft metal. It melts at 155° ± 1°, and not at 176°, as quoted by Winkler. When indium is allowed to remain in contact with water in the presence of air for several hours, a perceptible amount of indium hydroxide is produced. Indium is not acted on by dry air at the ordinary temperature.

Indium hydroxide readily forms colloidal solutions when washed with ammonia or with dimethylamine. Indium oxide is volatile at temperatures above 1000°. When heated in a current of hydrogen sulphide, indium oxide is converted into the scarlet sulphide. The sulphide, In_2S, was prepared by heating the ordinary sulphide in a current of hydrogen. It was obtained mixed with the ordinary sulphide.

Indium monochloride readily decomposes into indium and indium trichloride.

Indium oxychloride is obtained by passing a current of chlorine and oxygen over fused indium dichloride.

Indium monobromide is the first product of the action of bromine on heated indium; it was obtained as a red liquid, which solidified to a carmine-red mass. It is acted on by water to form indium and indium tribromide. Indium dibromide, prepared by the further action of bromine on indium until the heated mass became dark yellow, solidifies to an almost colourless mass; by the action of water, it is converted into the mono- and tri-bromides. When vaporised, it is converted into the monobromide and bromine. Indium fluoride, $InF_3,3H_2O$, prepared by the action of dilute hydrofluoric acid on indium oxide, forms rhombic pyramids; when its aqueous solution is boiled, indium hydroxide separates.

The electrical conductivity of indium chloride at varying dilutions was measured, as was also the potential of indium towards indium chloride. A. McK.

Cementation of Carbon Steels and of Special Steels. Léon Guillet (*Compt. rend.*, 1904, 138, 1600—1602. Compare Abstr., 1903, ii, 483).—Cementation experiments with a mixture of wood charcoal and 5 per cent. of potassium carbonate in an atmosphere of air or nitrogen show that the diminution in the rate of penetration is due to the volatility of the alkali salt, the same phenomenon not being observed when barium carbonate is used instead of potassium carbonate.

The presence of small quantities of elements other than carbon in steel plays an important part in the process of cementation, according as the second element is present in the form of a carbide or merely in solution; thus manganese, chromium, tungsten, or molybdenum increases the rate of cementation of steels, whilst nickel, titanium, silicon, aluminium, or tin retard the cementation or stop it altogether.

Steels in which the iron is in the γ-state and which contain a large proportion of nickel and manganese were found, after cementation at 1200° for 8 hours, to contain 1·35 per cent. of carbon in the superficial layer. After remaining at the ordinary temperature for 6 months, the percentage had fallen to 1·05, and at the end of 12 months to 0·85, showing that γ-iron dissolves carbon even at the ordinary temperature. M. A. W.

A New Molybdenum Carbide. HENRI MOISSAN and KARL HOFFMANN (*Compt. rend.*, 1904, **138**, 1558—1561. Compare Abstr., 1895, ii, 500).—When a mixture of fused molybdenum, carbon, and excess of aluminium is heated in an electric furnace, a new *molybdenum carbide*, MoC, is obtained in the form of a grey, crystalline powder having a sp. gr. 8·40 at 20° and a hardness of 7 to 8. The carbide is not attacked by hydrogen at a red heat, burns readily in fluorine, forming carbon tetrafluoride and molybdenum fluoride, is attacked at a red heat by chlorine, at a higher temperature by bromine, and is only superficially attacked at a still higher temperature by iodine; is readily attacked by a mixture of hydrogen chloride and bromine vapour, and oxidised by heating in air or oxygen, by projecting on to fused potassium chlorate or nitrate, or by the action of cold nitric acid. It does not decompose water even at 500—600°, is only slowly attacked by hydrochloric, hydrofluoric, or sulphuric acid, whilst it is unaltered by solutions of alkali hydroxides. M. A. W.

Mineralogical Chemistry.

Natron contained in the Urns of Maherpra (Thebes, Eighteenth Dynasty). LORTET and LOUIS HUGOUNENQ (*Compt. rend.*, 1904, **139**, 115—118).—The contents of the urns is a greyish-yellow mixture containing 25 per cent. of resins and vegetable matter, 15 per cent. of sand and clay, and 60 per cent. of "soda," having the composition 27·13 per cent. of sodium chloride, 41·76 per cent. of sodium sulphate, $Na_2SO_4,10H_2O$, and 31·09 per cent. of sodium sesquicarbonate, $Na_2CO_3,2NaHCO_3,3H_2O$ (compare Schweinfurth and Lewin, Abstr., 1900, ii, 283). The resinous matter, extracted by alcohol, consists chiefly of myrrh with a little olibanum and bdellium. M. A. W.

Compositions of a Scandinavian Form of Pyrochlor and of the Minerals accompanying it. G. P. TSCHERNIK (*J. Russ. Phys. Chem. Soc.*, 1904, **36**, 712—746).—The pyrochlor described was obtained in the form of small, well-formed octahedral crystals having the sp. gr. 4·955; analysis gave:

CaO.	Ta_2O_5.	Cb_2O_5.	Ce_2O_3.	Y_2O_3.	ThO_2.	ZrO_2	TiO_2.
10·62	33·03	30·70	5·90	0·46	traces	4·65	9·11

Na_2O.	MgO.	H_2O.	F.	Total.	O = 2F.	Total.
2·35	traces	1·37	2·17	100·36	0·91	99·45

These results correspond with the composition:

$$4(CaO,Ta_2O_5) + 6(CaO,Cb_2O_5) + Ce_2F_6 + 2(Na_2TiO_3 + ZrTi_2O_6 + 2H_2O).$$

Zircon was found with the above in badly-formed, brownish-yellow crystals, somewhat larger than those of the pyrochlor and having the sp. gr. 4·55. Analysis gave the numbers:

SiO_2.	ZrO_2.	Fe_2O_3.	CaO.	MgO.	H_2O.	Total.
32·44	65·76	0·42	0·09	traces	0·46	99·17

corresponding with the formula SiO_2,ZrO_2.

Titanic iron ore, mixed with the two preceding minerals, has the sp. gr. 4·755 and the composition:

TiO_2.	FeO.	MnO.	CaO.	MgO.	Total.
52·50	44·32	1·36	0·06	0·79	99·03

corresponding with the formula TiO_2,FeO. T. H. P.

Analysis of Kunzite. R. O. E. Davis (*Amer. J. Sci.*, 1904, [iv], 18, 29. Compare this vol., ii, 53).—Analysis of a deep lilac-coloured crystal gave the following results:

SiO_2.	Al_2O_3.	NiO.	MnO.	ZnO.	CaO.	K_2O.	Na_2O.	Li_2O.	Loss on ignition.	Total.
64·05	27·30	0·06	0·11	0·44	0·80	0·06	0·30	6·88	0·15	100·15

There is an absence of Mg, Cr, V, Ti, Fe, Sr, Ba, Th, Zr, Ce, Y, P. The mineral loses its pink colour on ignition. L. J. S.

New Theory of Uralitisation. Louis Duparc and Th. Hornung (*Compt. rend.*, 1904, 139, 223—225).—A series of magnetite-pyroxene-amphibole-labradorite rocks from Cérébriansky, in the northern Urals, show all stages in the passage from pyroxene to green amphibole, and are especially suitable for the study of the phenomenon of uralitisation. Analyses of the pyroxene and amphibole isolated from these rocks gave the results under I and II respectively, which dispose of the idea that the process of uralitisation is one of molecular transformation. The fact that the rocks are perfectly fresh also disposes of the theory of hydrochemical alteration. It is suggested that after the pyroxene crystallised out it was acted on by the residual magma and transformed in patches into amphibole.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	K_2O.	Na_2O.	Loss on ignition.	Total.	Sp.gr.
I.	50·91	2·64	—	10·07	trace	23·33	13·30	nil	nil	nil	100·25	3·358
II.	43·34	12·60	10·44	7·92	trace	13·06	12·60	0·02	1·90	0·22	102·10	3·213

L. J. S.

Physiological Chemistry.

Experiments made on Monte Rosa on the Respiration of Pure Oxygen and of Oxygen mixed with Carbon Dioxide. A. Mosso (*Atti Real. Accad. Lincei*, 1904, [v], 13, i, 670—680).—In Turin, the breathing of pure oxygen by a man produced no change in the respiration or pulse, but on Monte Rosa it altered the frequency of pulsation from 54 to 50 per 30 seconds and that of respiration from 22 to 20 per minute. On Monte Rosa, respiration of a mixture of 31 per cent. (? by volume) of carbon dioxide and 69 of oxygen produced a change in the frequency of the pulse from 60 to 50 per half minute and in that of respiration from 22 to 30 per minute; the patient experienced such a strong stimulus to breathe that it was impossible to hold the breath, and he felt that the thorax could be expanded better. In Turin, a similar mixture of carbon dioxide and oxygen was found to increase the frequency of pulsation from 30 to 36 per half minute, and that of respiration from 20 to 32 per minute; it quickly produced inconvenience, irritation of the throat, and slight dizziness, accompanied by an acid taste. These experiments were repeated on another man and on a dog, the results being similar to those just described.

T. H. P.

Further Observations on the Densimetric Method. Augustus D. Waller and B. J. Collingwood (*Proc. physiol. Soc.*, 1904, xxxvii—xliii; *J. Physiol.*, 31).—It is possible to determine the respiratory quotient (R) without a volumetric measurement of oxygen absorption by the formula $R = 0{\cdot}34p/1{\cdot}68p - m$, where p represents the percentage of carbon dioxide determined volumetrically, and m is the densimetric increment per 250 c.c. in milligrams. The way in which this formula is obtained is explained on simple mathematical grounds, and the fact that approximately accurate results are obtained is adduced as further evidence that the densimetric estimation of heavier substances like chloroform and ether vapour is trustworthy. W. D. H.

Density of Expired Air and Respiratory Quotient. W. Legge Symes (*Proc. physiol. Soc.*, 1904, lii—lv; *J. Physiol.*, 31).—Further mathematical treatment of the same problem. W. D. H.

Specific Gravity of Blood. O. Inchley (*Proc. physiol. Soc.*, 1904, xxxiii—xxxv; *J. Physiol.*, 31).—A number of standard bottles containing a mixture of chloroform and light petroleum and beads of known specific gravity. Drops of blood are introduced by means of a special pipette, which is described and figured. W. D. H.

Carbon Dioxide of Venous Blood and Alveolar Air in Cases of Diabetes. A. P. Beddard, Marcus S. Pembrey, and E. I. Spriggs (*Proc. physiol. Soc.*, 1904, xliv—xlvi; *J. Physiol.*, 31).—A series of analyses shows that there is a relation between the alkalinity and amount of carbon dioxide in venous blood, the two rising and falling together without being actually parallel. In the hyperpnœa of diabetic coma, there is a great reduction in the amount of carbon dioxide in the alveolar air, and an increase in the quantity of oxygen, but in diabetes without coma the former gas may be within normal limits. The low percentage of carbon dioxide in the alveolar air can be produced in a normal man at rest, and contrasts markedly with the condition of dyspnœa in heart disease, pernicious anæmia, and with the hyperpnœa of healthy men during exercise. It is probable that the respiratory centre is stimulated by substances other than carbon dioxide, and that in diabetic coma the hyperpnœa reduces the volume of carbon dioxide in the venous blood, for the pressure of alveolar carbon dioxide falls to 2·2 per cent. of an atmosphere. By treatment of such patients with injections of sodium hydrogen carbonate, the typical great ventilation of the chest usually disappears.

The present observations do not support the view that the low proportion of carbon dioxide in the venous blood in diabetic coma is directly dependent on the reduced alkalinity and a reduced carrying power of the blood for that gas. They suggest that the hyperpnœa is a cause, and not the effect, of the reduction of the carbon dioxide in the blood. Experiments still in progress indicate that there is also a diminished production of carbon dioxide. W. D. H.

Albumoses in Blood. EMIL ABDERHALDEN and CARL OPPENHEIMER (*Zeit. physiol. Chem.*, 1904, 42, 155—156).—Investigation of the plasma and serum of various animals led to the result that albumoses are usually absent from these fluids, or, if occasional traces occur, the amount is negligible so far as physiological importance is concerned.
W. D. H.

Choline in Blood and Cerebrospinal Fluid. RICHARD W. ALLEN (*Proc. physiol. Soc.*, 1904, lvi—lviii; *J. Physiol.*, 31).—A modification of the iodine test for choline is proposed, which avoids any risk of confusing that substance with alkaline chlorides. The results obtained confirm those previously given by Mott and Halliburton, who mainly used the platinic chloride test. Provided a nervous lesion is sufficiently extensive or acute, choline can be detected in the circulating fluids of the body. Cases of epilepsy gave negative results. Injection of choline into the brain substance directly is the only way in which it produces convulsions, but these are attributed, not to the drug, but rather to cerebellar irritation and increase of pressure. After repeated injections into the brain of the rabbit, there is a peculiar diffuse degeneration produced in some of the fibres of the spinal cord, especially in the dorsal region, great muscular weakness, and a peculiar change in the joints of the forelegs. No obvious effect has been produced in rats. W. D. H.

The Choline Test in Cerebrospinal Fluid. G. MANSFELD (*Zeit. physiol. Chem.*, 1904, 42, 157—164).—A criticism of Donath's work (this vol., ii, 63). The crystals he described are stated to consist, not of choline platinichloride, but of ammonium platinichloride.

W. D. H.

Embryonic Ferments. MARCUS HARTOG (*Proc. physiol. Soc.*, 1904, xlvii; *J. Physiol.*, 31).—An examination of the segmenting eggs of the frog shows the presence of a peptic ferment only active in acid liquids. A similar ferment was detected in the extra-vascular blastoderm of the chick of 2 to 4 days' incubation, with indication also of an inverting ferment. These ferments are very fugacious, disappearing from material treated with alcohol in the course of a few weeks, and from material in thymolised physiological salt solution in three weeks in the dark. W. D. H.

Solutions in which Sea Urchins' Eggs Develop. JACQUES LOEB (*Pflüger's Archiv*, 1904, 103, 503—509).—A further contribution to the subject on the lines of the author's previous work.

W. D. H.

Influence of Fasting and Feeding on Metabolism. MARCUS S. PEMBREY and E. I. SPRIGGS (*J. Physiol.*, 1904, 31, 320—345).—The percentage composition of well-fed rats is 17 to 22 parts proteid, 4 to 11 fats, and 60 to 70 water. After fasting for three days, a rat contained 2·68 per cent. of fat, which is so little less than in some normal animals that deductions are difficult. During fasting, the respiratory exchange quickly reaches a minimum, and then remains constant; the respiratory quotient falls to 0·75 or even 0·63. If the animal were feeding on its own fat, these numbers are too low; possibly some fat is converted into glycogen and sugar. An animal which had by fasting reached the minimal respiratory exchange is taken as the unit in feeding experiments; the effect of food rich in carbohydrates is well marked within an hour, and increases for 2 or 3 hours; the rise in the output of carbon dioxide varied from 14 to 97 per cent. of the minimal discharge during hunger. The increase in the absorption of oxygen was 9 to 35 per cent., but in three cases it fell below the minimum. This may be due to lessened muscular activity after food, or by the fact that carbohydrates yield more heat than do fat and proteid, when the consumption of oxygen is equal; thus the animal can satisfy its needs of energy by a smaller absorption of oxygen. The respiratory quotient after a meal rich in carbohydrates may rise to 1·17, and remain at 1·14 for 20 hours. This is due to increase in carbon dioxide discharged, not to decrease in absorption of oxygen, and is explained by the conversion of carbohydrates into fats, accompanied by an elimination of carbon dioxide. There is a general increase in the body metabolism. Calculations based on the theory that the quotients above unity are due to formation of fat give 0·59, 1·13, and 1·09 grams as the amount of fat deposited during the first three days of feeding. Calculations based on the data for the total respiratory and nitrogenous exchange give 2·30 and 2·65 grams as the daily amounts of fat that underwent combustion in the fasting rats. The heat produced during 24 hours is calculated to be 26,585 and 23,668 cal. for the fasting rats, and 32,812 and 29,460 cal. for the same animals after feeding.

A fast preceding a meal acts as a marked stimulus to the assimilation of food. Rats during fasting lose 5 to 8 per cent. of their weight in 24 hours, and during the first day of feeding gain a similar weight when allowance is made for the food in the alimentary canal.

The respiratory quotient is probably the resultant of quotients above and below the theoretical values for the combustion of proteids, carbohydrates, and fats. W. D. H.

Addition of Sodium Citrate to Cows' Milk in Infant Feeding. F. I. POYNTON (*Lancet*, 1904, ii, 433—436).)—In cases where it is necessary to use cows' milk in infant feeding, it is recommended that from 1 to 3 grains of sodium citrate be added per ounce. By causing partial decalcification, the formation of the usual massive curd is prevented. The added drug is harmless, and good results in all cases so treated are recorded. W. D. H.

Condition of Starch in Stale Bread. E. ROUX (*Compt. rend.*, 1894, 138, 1356—1358).—The starchy matter of stale bread seems to possess the same food value as in fresh bread.

In the case of flour, the soluble matter diminishes, whilst amylocellulose increases. The change is not influenced by addition of the same amount of sodium chloride as is employed in bread making.

N. H. J. M.

Alanine-feeding in Dogs without a Pancreas. GUSTAV EMBDEN and H. SALOMON (*Beitr. chem. Physiol. Path.*, 1904, 5, 507—509).—In a dog without a pancreas, and taking 200 grams of meat free from fat daily, the amount of sugar excreted per diem remained constant between 16 and 17 grams. One day, it received in addition 14 grams of alanine by the mouth and 20 grams subcutaneously; the sugar excreted rose to 29·3 grams and next day fell to 19. In another dog, the sugar excreted was reduced by absence of food to 2—4 grams daily; on the days when alanine was given, it rose to 18—19 grams. Whether the alanine is directly converted into sugar is not discussed. W. D. H.

Auto-digestion of Nucleo-proteids. WALTER JONES (*Zeit. physiol. Chem.*, 1904, 42, 35—54).—In auto-digestion of the thymus, xanthine, a small amount of hypoxanthine, and uracil are formed, but not guanine, adenine, or thymine, although these are produced by the action of mineral acids on thymus-nucleic acid. In auto-digestion of the suprarenal body, xanthine and a small amount of hypoxanthine are found, whilst by hydrolysis of the nucleo-proteid of the gland with boiling acids, guanine and adenine are formed. No noteworthy amount of leucine is formed. In auto-digestion of the spleen, guanine is formed as abundantly as in hydrolysis by acid of its nucleic acid; hypoxanthine is also formed on autolysis, and instead of adenine and uracil, as expected, thymine and cytosine are formed as on hydrolysis. The cause of these differences is discussed.

W. D. H.

Protective Value of Proteids and their Decomposition Products on Trypsin. Horace M. Vernon (*J. Physiol.*, 1904, **31**, 346—358).—The protective value of various substances on trypsin was estimated by keeping pancreatic extract with 0·4 per cent. sodium carbonate solution and a known percentage of the substance for 1 hour at 38°, and determining the amount of trypsin thus destroyed. The protective value depends principally on the power the substance possesses of neutralising the alkali, and so rendering it incapable of reacting on the ferment. Most proteids have the same protective value, 45 per cent. of the trypsin being destroyed in the presence of 0·4 per cent. of proteid, 27 per cent. in presence of 1 per cent. proteid, 12 per cent. in presence of 2 per cent. proteid, and 7 per cent. in presence of 4 per cent. proteid. When no proteid was present, 56 per cent. was destroyed. Hydrated proteids have a slightly greater protective value than native proteids, and the products of proteid hydrolysis a slightly greater one still. Aspartic acid and glycine have a somewhat greater value than proteids, leucine and hippuric acid about the same value, bile acids much less, whilst urea, creatine, and the sugars have none at all. If the acid radicles in various substances are neutralised previously, they lose their protective value.

In certain cases there is a combination between ferment, molecule, and proteid. Thus egg-albumin has a marked anti-tryptic action, the digestive power of the trypsin being reduced to 29 and 2·9 per cent. of its normal value in the presence of 0·05 and 1 per cent. of the proteid respectively. Also, a mixture of Witte's peptone with sodium carbonate sufficient for its complete neutralisation exerts a considerable protective action on the ferment. W. D. H.

Alimentary Origin of Arsenic in Man. Armand Gautier and P. Clausmann (*Compt. rend.*, 1904, **139**, 101—108).—The arsenic stated to be found in animal tissues is regarded as indispensable, not accidental. Accordingly various foods were examined in order to determine whence is derived this element, which is continually being got rid of by desquamation of the epidermis and by the excretions; forty different kinds of foods, animal, vegetable, wines, beer, water, salt, &c., were analysed, and arsenic was found in all, with two exceptions, beans and cabbages. It is specially abundant in the flesh of fish and crustacea. In the daily diet, it is calculated there are 21 thousands of a milligram, and in the year 7·6 mg. are taken, which are regarded as sufficient for the needs of the body. W. D. H.

Arsenic in Nutriment. V. Bordas (*Compt. rend.*, 1904, **139**, 234—236).—The harmful effect of arsenic, for instance, in producing neuritis when taken in beer has led the author to analyse various preparations of glycerol, glycero-phosphates, phospho-glycerates, chicory, and malt. The amount of arsenic found in many cases is sufficiently great to produce alarm, especially if the products are consumed or used in the preparation of the food consumed by young children for a prolonged period. W. D. H.

Localisation of Iodine in the African Turtle. Maurice Doyon and Chenu (*Compt. rend.*, 1904, 139, 157—158).—The amount of iodine in the thyroid, parathyroids, carapace, and eggs of the turtle are given. The parathyroids contain none, the other parts mentioned a few milligrams. W. D. H.

Oxidation in Animal Tissues. III. An. K. Medvedeff (*Pflüger's Archiv*, 1904, 103, 403—428).—An investigation of the oxidative action of liver extracts on salicylaldehyde. This is lessened or abolished by treatment with trypsin, but not with chloroform. The ferment is weakened by the accumulation of the product of its action (salicylic acid). Mathematical formulæ relating to the velocity of the reaction in varying circumstances are given. The active substance or ferment is doubtless of proteid nature, and in some way acts as a hydrogen consumer of the substance oxidised. W. D. H.

Reaction of Brain. Franz Müller and A. Ott (*Pflüger's Archiv*, 1904, 103, 493—502).—Attempts to resuscitate the brain of animals by oxygenated salt solutions, as in the work of Locke, Kuliabko, and others on the heart, failed. When the supply of blood to the brain ceases, the grey cortex rapidly undergoes changes that cause it to react acid to litmus. W. D. H.

Nature of Chemical and Electrical Stimulation. Albert P. Mathews (*Amer. J. Physiol.*, 1904, 11, 455—496).—From experiments on frogs' nerves, the conclusion is drawn that the action of a chemical reagent is dependent on the electrical state and stability of the ion, and is independent of chemical composition, except as the chemical composition may influence its velocity and weight. Chemical stimulation is thus electrical and dependent on the electrical charges of the ions. Whether any salt stimulates or depresses depends on the relative efficiency of its anion and cathion. If the anion predominates as in hydrates, the salt stimulates; if the cathion, it depresses. In other words, the ions are freely moving electrodes; the chemical composition of an electrode is of little importance compared with its electrical condition. W. D. H.

Action of Oxygen on Corneal Endothelium. G. Bullot (*J. Physiol.*, 1904, 31, 359—364).—If the eyeball of a rabbit has its corneal epithelium scraped off and is placed in moist air at 35° for 15 hours, the endothelium that covers the posterior surface of the cornea is still alive, as determined by its resistance to staining reagents. If, instead of air, a mixture of 1 part of air to 14 parts of hydrogen is employed, the endothelium is dead; this is regarded as equivalent to rarefying the air to 1/15. The same result is obtained with pure hydrogen. If the rarefaction is only 1/7 or 1/10, the endothelium remains alive in the centre, but is dead at the periphery; this was formerly supposed to be due to toxic material produced in the surrounding ciliary body. In pure oxygen up to 2·2 atmospheres the endothelium remains alive; if the pressure is increased to 3 to 4 atmospheres, it is killed; if the pressure is 2·4 atmospheres, the central region only is killed. The explanation previously advanced of a toxic substance is therefore abandoned, and the difference in behaviour to varying pressures must be due to physiological differences in the cells of the two regions.

W. D. H.

Lipase of the Liver. Rudolf Magnus (*Zeit. physiol. Chem.*, 1904, **42**, 149—154).—The ester-splitting ferment or lipase of the liver, as in the case of certain other enzymes, depends for its action on the presence of two substances. These are both contained in liver extracts, and can be separated by dialysis; one, the ferment, is not dialysable and is destroyed by heat; the other, called the 'co-ferment,' is dialysable and is not destroyed by boiling; its chemical nature is not known. Neither component by itself is effective. W. D. H.

Chemical Composition of Fish. H. Lichtenfelt (*Pflüger's Archiv*, 1904, **103**, 353—402).—The composition of the muscles of fish periodically changes with age, nutrition, and reproduction. Hunger increases the amount of water and diminishes the solids; the richer in fat the muscles were before, the more marked is this diminution; the amount of proteid goes down too, not only in the salmon but in other fishes also; the loss falls chiefly on the insoluble proteids. The soluble proteid, especially if work is done, may increase.

W. D. H.

The so-called Chlorophyll of Silk. Jules Villard (*Compt. rend.*, 1904, **139**, 165—166).—The green pigment of certain silk is not chlorophyll as alleged by Levrat and Conte. This conclusion agrees with that of Dubois. W. D. H.

Destruction of Adrenaline in the Living Animal. Otto Weiss and J. Harris (*Pflüger's Archiv*, 1904, **103**, 510—514).—The return of the blood pressure to the normal after an injection of adrenaline is not due to the rapid disappearance of the drug from the circulation, for if the blood is collected and a portion injected into another animal the usual rise of pressure is seen in that animal. The return of the pressure to normal is not attributed to nervous mechanism, but is probably due either to fatigue of the muscles of the vessels, or to the circumstance that they become accustomed to the stimulus.

W. D. H.

Purine Bases of Herring Brine. S. Isaac (*Beitr. chem. Physiol. Path.*, 1904, **5**, 500—506).—Guanine, adenine, hypoxanthine, and probably xanthine were identified. The most abundant bases were guanine and hypoxanthine. They are believed to originate mainly from the nuclein substances in the testis. W. D. H.

Phosphoric Acid in Cerebrospinal Fluid in Nervous Diseases. Julius Donath (*Zeit. physiol. Chem.*, 1904, **42**, 141—148).—Choline, a product of the breaking down of lecithin, is found in the cerebrospinal fluid in cases where the disintegration of nervous tissue is sufficient.

In the present paper, the question is asked whether in such cases the amount of phosphoric acid (also a product of lecithin decomposition) is increased also. In a case of tumour of the brain and in several cases of locomotor ataxy and progressive paralysis, the answer is in the affirmative; here also the amount of proteid in the fluid is increased. In cases of what are called functional diseases (epilepsy, melancholia, neurasthenia, hysteria), there is no such increase of either phosphoric acid or proteid. W. D. H.

Bacteriology of Empyema. W. J. S. Bythell (*J. Pathol. Bacteriol.*, 1904, 9, 365—399).—In a paper dealing with the pathology of empyema in children, the results of previous observers are confirmed that the two most important bacteria are the *pneumococcus* (especially) and the *streptococcus*. The latter organism produces milder symptoms. Tuberculosis is often present also. Infection of the pleura usually comes from a pulmonary lesion. W. D. H.

Fate of Certain Aromatic Acids in Alcaptonuria. Otto Neubauer and W. Falta (*Zeit. physiol. Chem.*, 1904, 42, 81—101).—In alcaptonuria, tyrosine and phenylalanine are not completely burnt, as in normal people, but are excreted as diphenolic acids (homogentisic and uroleucic acids). In order to determine whether a similar fate attends other aromatic acids, these were given by the mouth to a patient suffering from the condition, and an increase, if any, in the homogentisic acid excreted noted. Non-hydroxylic aromatic acids (phenylacetic, phenylpropionic, phenylacrylic) do not pass out as homogentisic acid; the same is true for monophenolic acids (*p*-coumaric, *o*-coumaric) and coumarin, and for diphenolic acids. It is only the aromatic and hydroxy-acids (phenyl-α-lactic, phenyl-β-lactic, phenylglyceric, &c.) which are excreted as homogentisic acid. These are regarded as intermediate products in the metabolic destruction of proteid. Theoretical deductions on the way in which aromatic substances are split off from proteid molecule are given. W. D. H.

Hæmatoporphyrinuria not due to Sulphonal. Archibald E. Garrod (*Trans. Path. Soc. London*, 1904, 55, 142—151).—Hæmatoporphyrinuria occasionally but rarely occurs in cases in which the influence of sulphonal or trional can be excluded; details and references to such cases are given. When not due to these drugs it is not specially met with in females, and has no particularly unfavourable prognostic significance. It may persist for many years, or recur intermittently. There is no evidence of serious implication of the liver in such cases. W. D. H.

Lethal Action of Acids and Bases on Paramœcium Aurelia. J. O. Wakelin Barratt (*Proc. Roy. Soc.*, 1904, 74, 100—104).—The minimal lethal doses of various acids and alkalis on known weights of *Paramœcium* are determined and the results given in tables. The considerable difference in ionic concentration both of acids and of bases for a nearly equal toxic effect shows that such effect is not hydrolytic in character, for in such a case the concentration of H^+ or

OH^- ions would be constant in each series. The relation between periodic grouping and lethal character exhibited by strong alkalis supports the view that the latter is dependent on a chemical reaction not hydrolytic in character. W. D. H.

Action of Poisons on Kidney and Spleen. GEORGE LYON (*J. Pathol. Bacteriol.*, 1904, 9, 400—455).—Diphtheria toxin, mercuric chloride, and cantharidin produce acute inflammatory conditions of the kidney in animals, but the changes are not analogous to those seen in man, the most marked difference being that after the administration of the poison ceases the kidney returns to the normal condition, and the inflammation is not followed by chronic or subacute changes resulting in fibrosis. The bulk of the paper deals with the histological changes described. Destruction of red corpuscles by phagocytes in the splenic pulp is a marked feature in all cases. W. D. H.

Action of Krait Venom. R. H. ELLIOTT and W. C. SILLAR (*Proc. Roy. Soc.*, 1904, 74, 108—109).—The symptoms produced by the venom of the common krait (*Bungarus cœruleus*) are similar to those of cobra poisoning, although there are great differences in relative degree. There was no evidence of hæmolysis or ante-mortem clotting in the blood. Minimal lethal doses for various animals are given. Calmette's serum is no protection. W. D. H.

Action of Sea Snake Venoms. I. THOMAS R. FRASER and R. H. ELLIOTT (*Proc. Roy. Soc.*, 1904, 74, 104—108).—The minimal lethal doses of the venoms of *Enhydrina valakadien* and *E. curtus* are given for various animals and compared with that of cobra venom. The *E. valakadien* is the most poisonous of the three. In the main, the symptoms are alike throughout, but dyspnœa is more urgent, and cardiac effects less so with the sea snakes as compared with the cobra. Calmette serum only feebly antagonises the sea snake venom.

W. D. H.

Action of Scorpion Venom. W. H. WILSON (*Proc. physiol. Soc.*, 1904, xlviii—xlix; *J. Physiol.*, 31).—The main symptoms, observed chiefly in experiments on guinea-pigs, are hypersecretion, convulsions followed by prolonged muscular spasms, and death from asphyxia. The body temperature is usually slightly raised. In dogs there is a good rise of arterial pressure, followed by a gradual fall and slowing of the heart. The coagulability of the blood is not altered; there is early onset of *rigor mortis*. The effect on muscle is a direct one; nerve trunks are not affected, and there is no excessive reflex excitability; the spasms in a frog are not removed by the destruction of the spinal cord. The simple muscle nerve resembles in many ways that produced by veratrine, that is, a condition in which the phenomena of fatigue are exaggerated. Cardiac and plain muscle react in a similar way. W. D. H.

Immunity of Certain Desert Animals to Scorpion Venom. W. H. WILSON (*Proc. physiol. Soc.*, 1904, l—lii; *J. Physiol.*, 31).—The animals inhabiting the Egyptian desert must frequently come into contact with scorpions. It therefore seemed probable that they would possess sufficient immunity to protect them from the fatal effect of a scorpion's sting. The examination of several kinds of desert animal (jerboa, gerbillus, &c.) shows that this is actually the case. These animals have a resistance nearly 300 times as great as that of the guinea-pig. The blood of these animals does not possess the power of destroying the active principle of the venom *in vitro*, and their isolated muscles are just as readily affected as those of rat or guinea-pig.

W. D. H.

Action of Potassium Salts on the Heart and Vessels of Mammals. LUDWIG BRAUN (*Pflüger's Archiv*, 1904, **103**, 476—492).—Intravenous injection of potassium salts produces an effect both on heart and blood vessels. Quite small doses (0·005 to 0·01 gram) in a rabbit produce a rise of blood pressure and an increase in the heart rate. Larger doses (0·01 to 0·2 gram) produce a fall of blood pressure followed by a rise due to vaso-constriction. Lethal doses kill by stopping the heart, as Blake pointed out in 1839. With large doses which are not fatal, there is only a fall of blood pressure of cardiac origin; on the recovery, the "vagus pulse" is well seen. The heart, before it ceases to beat, exhibits fibrillary twitchings. Previous atropinisation makes no difference to the result. Vaso-dilatation was never seen. The therapeutic use of potassium as a heart stimulant is contra-indicated. W. D. H.

Action of Amyleine Hydrochloride on Cilia. L. LAUNOY (*Compt. rend.*, 1904, **139**, 162—165).—The local application of this drug to the pharynx of the frog produces a temporary tonic effect on, followed by an adynamic condition of, the cilia. W. D. H.

Behaviour of αβ-Diaminopropionic Acid in the Body. PAUL MAYER (*Zeit. physiol. Chem.*, 1904, **42**, 59—64).—Subcutaneous injection of the hydrochloride of αβ-diaminopropionic acid into rabbits produces temporary dyspnœa; the free acid is very poisonous. After one dose of 5 to 10 grams, neither the unaltered acid nor glyceric acid could be found in the urine, but after more prolonged dosage a small quantity of glyceric acid was found, showing that the diamino-acid had been deprived of both its amino-groups. W. D. H.

Action of Sodium Sulphite, Aldehyde Sodium Hydrogen Sulphite, Acetone Sodium Hydrogen Sulphite, and Other Substances on Toads. FR. FRANZ (*Chem. Centr.*, 1904, ii, 141—142; from *Arb. Kais. Ges.-A.*, **21**, 304—311).—Experiments on toads have shown that solutions of normal sodium sulphite, aldehyde sodium hydrogen sulphite, and acetone sodium hydrogen sulphite of concentrations equivalent respectively to 0·224, 0·672—0·896, and 0·112 per cent. of sulphur dioxide caused death within the same time. Solutions which were fatal to toads also caused the death of other animals within 42 hours. Solutions containing less than 0·112, 0·448—0·672, and 0·0224 per cent. respectively of sulphur dioxide in the form of sodium sulphite and the compounds of aldehyde and acetone appeared to have no effect. Experiments have also been made with sodium chloride, sodium nitrate, sodium sulphate, sodium carbonate and sodium borate, sodium bromide, sodium iodide, sodium fluoride, and boric acid. A 1/100 normal solution of sodium fluoride was found to kill toads within 8—44 hours, whilst a 1 per cent. solution of boric acid or a 1·01 per cent. solution of borax was fatal in 3¼—16 hours. E. W. W.

Comparative Tests of the Pharmacological Action of Sulphurous Acid contained in Organic Compounds and that Contained in Normal Sodium Sulphite. Eugen Rost and Fr. Franz (*Chem. Centr.*, 1904, ii, 142 ; from *Arb. Kais. Ges.-A.*, 21, 312—371. Compare Kerp, this vol., i, 713).

Pharmacological Examination of Corydalis Alkaloids. Friedrich Peters (*Chem. Centr.*, 1904, ii, 145 ; from *Arch. exp. Path. Pharm.*, 51, 130—174).—Experiments on frogs, guinea-pigs, rabbits, cats, and dogs have shown that the corydalis alkaloids may be divided, according to their physiological action, into three classes, which are identical with those suggested by their chemical behaviour (compare Gadamer, Abstr., 1902, i, 306, 391). Corytuberine differs physiologically, as well as chemically, from the other alkaloids ; it does not directly attack the heart, and has no narcotic effect on frogs. The alkaloids of the corydaline group resemble those of the morphine group, and cause paralysis of the spinal marrow. The corycavine alkaloids excite the motor centres. The bulbocapnine group are analogous to the codeine alkaloids and increase reflex excitability in the case of frogs. E. W. W.

Effect of Suprarenal Extract on the Frog's Pupil. S. J. Meltzer and Clara Meltzer Auer (*Amer. J. Physiol.*, 1904, 11, 449—454).—In mammals, adrenaline produces no effect on the pupil, whether given subcutaneously or locally applied ; dilatation does, however, occur after intravenous injection if the superior cervical ganglion is previously removed.

In frogs, the case is different. Extreme and prolonged dilatation is the result of either method of administration, even after the eye has been removed from the body. This reaction may be used as a test for adrenaline. W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Destruction of Bacteria [in Water] by Aëration and by Hydrogen Peroxide. Küster (*Arch. Hygiene*, 1904, 50, 364—387). —The number of germs in water is considerably diminished by aëration when the water is at the same time cooled by means of ice. Cooling alone had a slight effect.

Hydrogen peroxide was found to have considerable value as a disinfectant, and its employment for purifying small quantities of water is recommended. N. H. J. M.

Absence of Bacillus Coli in Unpolluted Water. A. C. Houston (*J. Pathol. Bacteriol.*, 1904, 9, 456—471).—*Bacillus coli* is present in large quantities in sewage, and there is a broad parallelism between the number of the bacilli in sewage-polluted waters and the degree of contamination with sewage. In order to make the importance of the bacilli more evident, it is necessary to show further that the *B. coli* is absent from relatively large quantities of unpolluted sea water and the water of tidal rivers; this is what the bulk of the present paper is concerned in proving is the case. W. D. H.

Detection of Bacillus Enteritidis Sporogenes in Water. R. Tanner Hewlett (*Trans. Path. Soc. London*, 1904, 55, 123—126).—A modification in the manner of carrying out the milk test for this sewage microbe is suggested. W. D. H.

Respiration-enzymes of Moulds. S. Kostytscheff (*Chem. Centr.*, 1904, ii, 48—49; from *Ber. Deutsch. Bot. Ges.*, 22, 207—215).—The following conclusions have been derived from the results of experiments. (1) The absorption of oxygen and the liberation of carbon dioxide by moulds in the process of respiration is at least partly due to the action of specific enzymes. (2) The formation of carbon dioxide when oxygen is excluded is effected by means of an enzyme which is not identical with Buchner's zymase. (3) Stoklasa and Czerny's theory of the formation of zymase by aërobic organisms is not quite correct (Abstr., 1903, ii, 320). (4) Although the enzyme concerned in the process of "anaërobic" respiration also occurs in organisms which have lived under conditions in which they had access to oxygen, it cannot be assumed that anaërobic respiration is the initial stage of normal respiration, since (5) by drying the acetone preparation in absence of oxygen at 100° it may be rendered inactive, whilst if oxygen is not excluded the activity is not destroyed.

E. W. W.

Relation of Staphylococcus Pyogenes Aureus to Rheumatic Fever. F. J. Poynton and W. V. Shaw (*Trans. Path. Soc. London*, 1904, 55, 126—140).—This micro-organism is not the cause of rheumatic fever either in simple or mixed infection. Rheumatic fever is not an attenuated pyæmia so far as *S. aureus* is concerned.

W. D. H.

Action of Salts of the Alkaline Earths on Living Substance. N. C. Paulesco (*Compt. rend.*, 1904, 139, 158—160).—The doses of salts of calcium, barium, and strontium necessary to prevent the formation of carbon dioxide by yeast are proportional to their molecular weights. One molecule of such a salt produces an effect equivalent to that of one molecule of a salt of the alkalis.

W. D. H.

Behaviour of Cultures of Some Races of Yeast at Different Temperatures in Reference to Activity of the Enzymes, Length of Life, Resisting Power, and Death. WILHELM HENNEBERG (*Chem. Centr.*, 1904, ii, 52—54; from *Zeit. Spirit. ind.*, 27, 96—97, 105—106, 116—117, 126—127, 135—136, 146—147, 160—161, 173, 182—183, 194—195, 205—207, 213—214, 226, 239).—The abstract contains a description of the behaviour of some different types of yeast under varying conditions of temperature, &c., together with a brief account of the glycogen, fat, peptase, catalase, zymase, and invertin contained in the cells and the changes which these substances undergo or effect. The liability of yeasts to putrefaction and its cause is also briefly discussed.

E. W. W.

Zymase and Alcoholic Fermentation. PIERRE MAZÉ (*Compt. rend.*, 1904, 138, 1514—1517).—Zymase is widely spread in living cells both in contact with air and without air. It accumulates, however, most readily in absence of oxygen.

Zymase may be considered as being formed by the union of two diastases, one of which transforms sugar into lactic acid, the other converting lactic acid into alcohol and carbon dioxide. This is confirmed by the results of Buchner and Meisenheimer, who consider that lactic acid is an intermediate product between fermentable hexoses and alcohol.

N. H. J. M.

Variations in the Composition of Seeds during Maturation. GUSTAV ANDRÉ (*Compt. rend.*, 1904, 138, 1510—1512).—The seeds examined were white lupins, haricots, and maize. The total nitrogen increased in the dry matter during the whole period, but the percentage amounts both of nitrogen and ash are higher in very young seeds than when maturity is approached.

During maturation there is a conversion of carbohydrates soluble in water into insoluble carbohydrates saccharifiable by dilute acids.

N. H. J. M.

Mathematical Expression for the Velocity of Flow of Water through a Cell, according to Pfeffer's First and Third Schemes. W. W. LEPESCHKIN (*Zeit. physikal. Chem.*, 1904, 48, 596—600).—A mathematical paper, chiefly of interest to botanists. The formula has been applied to the secretion of water in uni- and multi-cellular plants, and has given results in complete accord with the experimental data.

J. C. P.

Distribution of Some Organic Substances in Orange Flowers. EUGÈNE CHARABOT and G. LALOUE (*Compt. rend.*, 1904, 138, 1513—1514).—The greater part of the essential oil of orange flowers is contained in the petals. The formation and accumulation of odoriferous substances in the flower is most active when the flower is fully developed.

In the flowering period, the essential oil becomes richer in ethers of terpenic alcohols, in methyl anthranilate, and in total alcohol. Esterification is distinctly less complete in the flower than in the leaves and stems. The proportions of geraniol and linalool increase and diminish respectively.

The essential oil present in the proteids is very similar in composition to that of the other floral organs after the flowers have opened out; the former contains, however, rather more methyl anthranilate than the latter. N. H. J. M.

Invertase of the Beet. Max Gonnermann (*Beitr. chem. Physiol. Path.*, 1904, 5, 512—514).—A question of priority in the discovery of this ferment in the sugar-beets raised by a recent paper by Stoklasa and others. It was described by the author six years ago.

W. D. H.

Lipolytic Action of the Cytoplasm of Ricinus Seed. Maurice Nicloux (*Compt. rend.*, 1904, 138, 1288—1291).—The saponification of fats by the cytoplasm takes place at a rate which accords with the dynamic equation for a unimolecular reaction. The cytoplasm remains unchanged during the process, but the glycerol and fatty acids produced exert a retarding action. When the quantities of cytoplasm are small, the amounts of fat saponified in a given time are proportional to the quantities of active substance present. The rate of saponification increases with the temperature up to about 35° and then decreases. Exposure to 55° for 10 minutes stops the saponification. The phenomena observed are very similar to those already noted in connection with the action of the various diastases.

H. M. D.

Hydrolysing Properties of Ricinus Seed. Ed. Urbain and L. Saugon (*Compt. rend.*, 1904, 138, 1291—1292).—The conversion of starch into sugar and the process of inversion are both effected by the action of ricinus seed. Quantitative experiments indicate that the cytoplasm is the active constituent of the seed in both cases. The amounts of starch or sugar transformed in 24 hours are the same whether the experiments are carried out with the seed itself or with a quantity of the cytoplasm equal to that contained in the seed. The authors demonstrate further that the two processes mentioned, as well as the saponification of fatty substances, can be simultaneously effected by the action of the cytoplasm. H. M. D.

The Lipolytic Property of the Cytoplasm of Ricinus Seed is not due to a Soluble Ferment. Maurice Nicloux (*Compt. rend.*, 1904, 138, 1352—1354).—The lipolytic agent, of which the cytoplasm is probably only the support, is not a ferment soluble in water, and thus differs from the known lipases. Water at once deprives the saponifying agent of its hydrolysing properties when no longer protected by the oil (compare this vol., ii, 508). N. H. J. M.

Sulphurous Acid in Wine. I. General. Wilhelm Kerp (*Chem. Centr.*, 1904, ii, 56; from *Arb. Kais. Ges.-A.*, 21, 141—155).—The original paper contains a *résumé* of previous work in reference to the presence of sulphurous acid in wine, from which the results of the analyses of 1071 wines have been collected. Of these wines, 460 contained up to 0·05 gram of sulphur dioxide per litre; 366, 0·051 to 0·1; 150, 0·101 to 0·15; 63, 0·151 to 0·2, and 32 more than 0·2 gram per litre. The largest quantity detected was 0·466 gram per litre. The data show, however, that, generally speaking, wines do not contain more than 0·02 gram per litre. E. W. W.

Sulphurous Acid in Wine. II. Aldehyde-sulphurous Acid in Wine. Wilhelm Kerp (*Chem. Centr.*, 1904, ii, 56—57; from *Arb. Kais. Ges.-A.*, 21, 156—179).—The original paper contains a description of the properties of the acetaldehyde-sulphurous acid compound contained in wine (Abstr., 1903, ii, 326). The presence of acetaldehyde in wine may be detected by means of the sodium hydrogen sulphite compound or benzeneazoformazyl; Lewin's reaction (Abstr., 1900, ii, 179) is also applicable. The acetaldehyde-sulphurous acid compound is also contained in wine. In aqueous solution it is partially hydrolysed, forming sulphurous acid and aldehyde, but even in very dilute solutions the amount of decomposition is extremely small. The "free" sulphurous acid may be titrated directly with iodine solution. The velocity of combination of sulphurous acid and aldehyde depends on the concentration of the solution, and for this reason Ripper's method of determining sulphurous acid in wine (Abstr., 1893, ii, 189) only gives approximate results. In fermented wines which have had only a moderate treatment with sulphur, the combined sulphur dioxide is contained in the form of the acetaldehyde compound, but in sulphurated musts and strongly sulphurated sweet wines the excess of sulphur dioxide must be assumed to be in combination with dextrose and lævulose. Since the latter compounds are more readily hydrolysed in aqueous solution, it follows that in certain cases the sulphurous acid contained in must cannot be regarded pharmacologically as identical with that contained in wine.

E. W. W.

Progressive Ripening of Cheeses. Léon Lindet and Louis Ammann (*Compt. rend.*, 1904, 138, 1640—1643).—Three types of cheese, camembert, Port-salut, and gruyère, were examined with regard to the rate of degradation of the casein into soluble nitrogenous matter, and its conversion into ammonia and ammonium compounds; these changes are much more complete in the camembert than in either of the other two cheeses, the amount of soluble nitrogen after 34 days being 86·1 per cent. of the total nitrogen in the case of camembert, and only 20·2 after 49 days in the case of Port-salut, and 15·1 after 87 days in the case of gruyère.

Camembert cheese contains no lactic acid, but a small constant quantity of butyric acid (0·09 to 0·07 per cent.), due to the rapid transformation of lactose, is present throughout the ripening process.

The ripening of gruyère cheese is accompanied by an increasing proportion, 0·08 to 0·64 per cent., of the volatile fatty acids, acetic, propionic, and lactic, due to the degradation of the casein and not to the saponification of the fats, for a gruyère made from milk entirely free from cream contained the same proportions of the same fatty acids.

M. A. W.

Calcium Sulphide for Dodder and other Injurious Parasites. Félix Garrigou (*Compt. rend.*, 1904, 138, 1549—1550).—Calcium sulphide proved to be effective in destroying animal and vegetable parasites. In dry weather, the powder must be made slightly damp.

N. H. J. M.

Complete Humic Manure. J. Dumont (*Compt. rend.*, 1904, **138**, 1429—1431).—The manure was prepared by treating a black soil, containing 2 per cent. of nitrogen, with a concentrated pearl ash solution containing aluminium phosphate. The dry matter contained: soluble humates, 50·4; insoluble substances, 49·6; organic nitrogen, 1·6; P_2O_5, 2·9; and K_2O, 5·5 per cent.

The results of experiments in which lucerne, sugar beet, potatoes, wheat, and mangels were manured with the humic preparation (600—1000 kilos.) showed increased yields, whilst in the case of sugar beet the percentage of sugar was raised 30 per cent. It is, however, uncertain to what extent the benefit must be attributed to the humic acid and the phosphoric acid respectively. N. H. J. M.

Analytical Chemistry.

Explosion Pipette. Otto Pfeiffer (*Chem. Zeit.*, 1904, 28, 686). —In the pipette described, water containing 0·5 per cent. of sulphuric acid is substituted for mercury. Before the explosion, the bulk of the water is withdrawn by suction into a bulb, which is connected with the explosion bulb by a stop-cock. The explosion bulb is also provided with a stop-cock, and the platinum electrodes are specially constructed to obviate the formation of drops at the points.

A. McK.

A Comparison of Different Types of Calorimeter. Thomas Gray and Joseph G. Robertson (*J. Soc. Chem. Ind.*, 1904, 23, 704—707).—The experiments described were carried out to ascertain the degree of accuracy of the results obtained by the Lewis Thompson and the William Thompson calorimeters in comparison with those yielded by combustion in compressed oxygen, the modification designed by Langbein (Abstr., 1901, ii, 128) being used for the latter purpose. The values obtained by the first-mentioned instrument were much too low, and were even untrustworthy when a correction was made for unburnt carbon. At the best the method gave only a rough estimation of the heating values of bituminous coals. It failed entirely in the case of anthracite coals. Sufficiently accurate results for practical purposes were obtained by the William Thompson calorimeter, provided that the oxygen supply was carefully regulated.

W. P. S.

Rapid Estimation of Sulphur in Iron by Evolution. S. S. KNIGHT (*Amer. Chem. J.*, 1904, 32, 84—85).—Two grams of the sample are mixed with one gram of pure reduced iron, the sulphur contents of which is accurately known, the mixture is placed in a porcelain crucible, and another gram of reduced iron is sprinkled over the top. After covering the mass with a disc of pure filter paper, the lid is put on and the whole is ignited for 10 minutes at the highest heat obtainable with the blast lamp. After this treatment, the iron will yield the whole of the sulphur as hydrogen sulphide when dissolved in hydrochloric acid. The gases evolved are passed through an ammoniacal solution of cadmium chloride, and the cadmium sulphide formed is then titrated with standard iodine as usual. L. DE K.

Estimation of Persulphates. E. PANNAIN (*Gazzetta*, 1904, 34, i, 500—504).—Hydrazine, liberated from its salts by the action of concentrated potassium hydroxide solution, reacts with the persulphates, thus: $2K_2S_2O_8 + N_2H_4,H_2SO_4 + 6KOH = 5K_2SO_4 + N_2 + 6H_2O$. Measurement in Lunge's nitrometer of the nitrogen evolved gives the amount of the persulphate. The method is simple and rapid, and is recommended by the author for checking the electrolytic preparation of persulphates. T. H. P.

Combined Sulphurous Acids. WILHELM KERP (*Chem. Centr.*, 1904, ii, 59; from *Arb. Kais. Ges.-A.*, 21, 372—376).—A description of Farnsteiner's results (compare this vol., ii, 443). E. W. W.

Occurrence of Sulphurous Acid in Dried Fruits and other Foods. H. SCHMIDT (*Chem. Centr.*, 1904, ii, 59—60; from *Arb. Kais. Ges.-A.*, 21, 226—284).—The presence of sulphurous acid in foods is best detected by acidifying the ground or macerated material with phosphoric acid and then adding a drop of very dilute iodine-starch or potassium iodate-starch solution. For quantitative determination, the sulphur dioxide should be removed by distillation. Since some natural processes interfere with the method, the results of analysis should be received with caution, and very small quantities of barium sulphate should be neglected. The behaviour of the sulphurous acid contained in dried fruit towards water and dilute alkalis shows that it is present in a combined form, probably as a dextrose compound. Proteids and cellulose are also able to combine with this acid. The presence of free sulphurous acid could not be detected with certainty in dried fruit. By exposure to the air, the fruit loses sulphur dioxide, but so slowly that for practical purposes the loss may be disregarded. In the process of manufacture, a portion of the sulphurous acid is removed by treatment with water, and the amount lost is proportional to the quantity of water used. E. W. W.

Estimation of Tellurium by the Electrolytic Method. G. Gallo (*Atti R. Accad. Lincei*, 1904, [v], 13, i, 713—717).—The method given by Pellini (this vol., ii, 147) for the electrolytic estimation of tellurium does not always lead to good results, and only allows of the quantitative deposition of a small quantity of that element. The following procedure yields more satisfactory results, and permits of the deposition of as much as 0·4 gram of tellurium, the error never exceeding 0·0006 gram. Pure redistilled tellurium is weighed out into a Classen crucible with a matt surface, mixed with 10 c.c. of concentrated sulphuric acid, and gently heated until the red coloration disappears and white fumes begin to be formed. When the mass is cool, a few c.c. of water, previously boiled and cooled in carbon dioxide, are carefully added and then 100—150 c.c. of 10 per cent. sodium or potassium pyrophosphate solution freed from air like the water. The liquid is then gently heated until complete solution takes place and the temperature raised to 60—62°, which must be maintained constant during the electrolysis. The anode used is a spiral of platinum wire, the normal current density being 0·025 ampere with a potential difference at the electrodes of 1·8—2 volts. The water gradually evaporating is automatically replaced by air-free water flowing down the anodic wire. A little of the pyrophosphate solution is added from time to time so as to increase gradually the volume of the liquid, the deposit of tellurium obtained thus increasing in thickness from the top to the bottom. At the conclusion of the electrolysis (Pellini, *loc. cit.*), the deposit is washed once with air-free water, or, better, with sulphurous acid solution, and then twice with absolute alcohol, after which the capsule is dried for ten minutes at 100°, cooled for at least two hours in a vacuum desiccator, and weighed: 0·025 gram of tellurium can be deposited per hour in this way. T. H. P.

Estimation of Hydroxylamine by means of Ferric Alum and Potassium Permanganate. Auguste Leuba (*Ann. Chim. anal.*, 1904, 9, 246—248).—It has been proposed to add to a weighed quantity of hydroxylamine an excess of ferric alum and then to titrate the ferrous iron formed in the reaction. The author, having investigated the method, concludes that it is worthless, as the results may vary from 80 to 160 per cent. of the quantity actually present. The best results are obtained when operating just below the boiling point. L. de K.

[Detection of Minute Traces of Arsenic.] G. Todeschini (*Gazzetta*, 1904, 34, i, 492).—The author replies to Gautier's criticisms (*Gazzetta*, 1903, 33, i, 447) of his work on this subject (*Atti R. Istit. Veneto*, 61, 1901—1902). T. H. P.

Detection of Arsenic in Glycerol from Soap-Lyes. Marius Vizern and L. Guillot (*Ann. Chim. anal.*, 1904, 9, 248—251).—Fifty grams of the sample are diluted to 100 c.c. Ten c.c. of this solution are put into a tube and mixed with 2 c.c. of 10 per cent. hydrogen peroxide and 2 c.c. of hydrochloric acid. The mixture is boiled for a minute to oxidise sulphur compounds, and, when cold, introduced into a test-tube 20 cm. long and 2 c.c. wide. A piece of pure zinc weighing about 1 gram and a small fragment of copper sulphate are added, and a piece of filter paper impregnated with mercuric chloride is tied over the mouth of the tube. If after 15 minutes the interior of the paper disc assumes a pale yellow colour, the sample contains at least 1 part of arsenic per 100,000.

L. de K.

Estimation of Boric Acid. Milton F. Schaak (*J. Soc. Chem. Ind.*, 1904, 23, 699—701).—Two methods are described for the estimation of boric acid in minerals. In the first, the substance is decomposed by boiling with hydrochloric acid in a flask under a reflux apparatus. After cooling, the solution is diluted to a known volume and filtered. A definite volume of the filtrate is nearly neutralised with sodium hydroxide, using methyl-orange as indicator, and treated with 2 or 3 grams of barium carbonate. The mixture is heated for half an hour on a water-bath, cooled, and again diluted to a known volume. Iron and aluminium salts are completely precipitated by the barium carbonate. After filtering, a portion of the filtrate is neutralised exactly, using methyl-orange as indicator, and then titrated with standard alkali solution in the presence of glycerol and a little phenolphthalein.

In cases where it is desired to have the boric acid free from other substances before titration, the mineral is gently heated in a flask with a little concentrated sulphuric acid to remove carbon dioxide and volatile acids. Methyl alcohol, in quantity about 20 times that of the free sulphuric acid, is added, and the mixture distilled, a current of methyl alcohol vapour being passed into the flask during the distillation. The distillate is collected in a receiver containing water, the end of the condenser dipping below the surface of the latter. For safety the receiver is trapped with a Mohr's bulb containing water. The distillation is usually completed in 30 minutes, when the contents of the receiver and bulb are united and titrated as usual. Fluorine, when present in the mineral, must be removed before distilling. Borates, which are not decomposed by concentrated sulphuric acid, should be previously treated by suitable methods of fusion.

W. P. S.

General and Physical Chemistry.

Disappearance of the Spectral Lines of Silicon, exhibited by Certain Stars, under the Influence of the Oscillatory Spark Discharge. ARNAUD DE GRAMONT (*Compt. rend.*, 1904, 139, 188—191).—Certain lines in the silicon spectrum become very faint under the influence of self-induction introduced into the discharge circuit, and disappear completely when the self-induction is still comparatively feeble. The intensity of other lines is scarcely altered, and in some cases is very slightly increased by the self-induction. Measurements of the wave-lengths of the two classes of lines in the visible and ultra-violet part of the spectrum are recorded, and a comparison of these with stellar lines is made. H. M. D.

Refractive Index of Solutions. C. CHÉNEVEAU (*Compt. rend.*, 1904, 139, 361—363).—The author, in reply to van Aubel, brings forward data in support of his contention that the quantity $\Delta = n - n_e$ measures the specific influence exerted by the dissolved substance on the refraction of solutions, and is proportional to its concentration, when n represents the refractive index of the solution and n_e that of the solvent calculated for its state of dilution on the basis of Gladstone's law. Data for solutions of lithium chloride in water and amyl alcohol, of ethylene bromide in propyl alcohol, and of chloral hydrate in water, ethyl alcohol, and toluene are shown to satisfy the relationship. H. M. D.

Some Facts relating to the Observation of Variations in the Brightness of Phosphorescent Sulphides under the Action of *n*-Rays or Analogous Agents. E. BICHAT (*Compt. rend.*, 1904, 139, 254—256).—The author describes a number of experiments which show that the increase or diminution in the brightness of a phosphorescent screen exposed to Blondlot rays or emanations depends not only on the nature of the rays, but also on the condition of the source of the rays or of the observer in respect of electric isolation or of earth contact. M. A. W.

The Nature of *n*- and n_1-Rays, and the Radioactivity of Substances which emit these Radiations. JEAN BECQUEREL (*Compt. rend.*, 1904, 139, 264—267. Compare this vol., ii, 603).—When the Blondlot rays emitted from tempered steel, Rupert's drops, compressed wood, or insolated calcium sulphide are allowed to traverse a magnetic field normally to the lines of force, they are divided into three elements: (1) non-deviated rays which have no action on a calcium sulphide screen, but which give rise to *n*- or n_1-rays when they fall on a uranium salt or a salt of poloniferous bismuth respectively; (2) rays deviated and considerably dispersed, identical with the cathode or β-rays; (3) rays deviated in the direction of the α-rays, but to a greater extent. M. A. W.

The Refraction of n- and n_1-Rays. JEAN BECQUEREL (*Compt. rend.*, 1904, 139, 267—270. Compare preceding abstract).—The author describes experiments which serve to show that the element of the Blondlot rays which is not deviated in a magnetic field is also that element which undergoes refraction on passing through an aluminium prism, and the refracted rays are able to combine with β- or α-rays to give rise to n- or n_1-rays respectively. M. A. W.

Radioactive Lead, Radio-tellurium, and Polonium. ANDRÉ DEBIERNE (*Compt. rend.*, 1904, 139, 281—283).—The lead salts obtained from pitchblende from which the radium has been extracted show a very feeble radioactivity, about twice that of uranium; by repeated fractional precipitation of the lead by means of hydrochloric acid, a residue is obtained from which a small quantity of basic bismuth nitrate can be precipitated which has all the characteristics of poloniferous bismuth, its radioactivity being about 100,000 times that of uranium, and consisting, like polonium, of homogeneous, slightly penetrating rays, difficultly deviable in the magnetic field (compare Curie, Abstr., 1900, ii, 126). Further, the radioactive substance possesses all the characteristic properties of Marckwald's radio-tellurium (compare Abstr., 1903, ii, 81, 733), giving a slight precipitate with stannous chloride and a slight deposit on a sheet of bismuth, each of which is very strongly radioactive. The author concludes, therefore, that the radioactive substance obtained as above, radioactive lead (compare Hofmann and Strauss, Abstr., 1901, ii, 19, 159, 385, 655; 1902, ii, 79, 261, 397; 1903, ii, 402), and radio-tellurium are identical with the element polonium (compare Giesel, Abstr., 1902, ii, 78, 208; 1903, ii, 20), which is the only radioactive substance in pitchblende capable of being precipitated by hydrogen sulphide in acid solution. M. A. W.

Molecular Attraction. J. E. MILLS (*J. Physical Chem.*, 1904, 8, 383—415).—A continuation of the previous paper (Abstr., 1902, ii, 596). The author briefly reviews the assumptions on which he bases the hypothesis that the internal latent heat is solely spent in changing the distances between the molecules, and points out that no assumption is made which has not been frequently accepted or assumed by leading physical chemists. If the molecular attraction obeys the law of inverse squares, the internal latent heat for each substance should be $K(\sqrt[3]{d}-\sqrt[3]{D})$, where d, D are the densities in the liquid and gaseous states. In the present paper, the author has calculated the value of the internal latent heat at various temperatures from the temperature coefficient of the vapour pressure, employing the vapour pressure data of Ramsay and Young. The ratio of these values to the values of $(\sqrt[3]{d}-\sqrt[3]{D})$ were then found for temperatures from 0° to the critical temperature. Twenty-one compounds were investigated and in almost all cases the ratio was as constant as the experimental errors would allow. In the case of water, the alcohols, and acetic acid, it was not expected that constancy would be obtained on account of association; except in the case of acetic acid, constant values were obtained, however, and this, in the author's opinion, indicates that the association is due to the molecular attraction. Only in the case of stannic chloride was the variation of the constant (26·2 at 0°, 22·15 at 280°) greater than that due to errors of experiment. The author hence considers that the law of inverse squares is established for molecular attraction. L. M. J.

Properties of Substances regarded as Functions of the Space Occupied by their Atoms and Molecules. Systematic Classification of the Elements. ISIDOR TRAUBE (*Zeit. anorg. Chem.*, 1904, **40**, 372—384).—The physical and chemical properties of elements and compounds depend primarily on the space occupied by their atoms and molecules. The latter factor has a much greater influence on the general properties of substances than the atomic weight has. The relation between volume and pressure, hardness, expansion by heat, melting point, boiling point, surface tension, specific heat, valency, and other properties is discussed. If the volume of a substance at two different temperatures is known, it should be possible to describe its physical and chemical properties not only qualitatively, but to a large extent quantitatively; this would not be possible if the atomic weight only of the substance was known. The question is raised as to whether it would not be more convenient to regard the atomic weight as a function of the atomic volume instead of the converse view, commonly accepted. A. McK.

Diffusion of Argon and Helium. RUDOLF SCHMIDT (*Ann. Physik*, 1904, [iv], **14**, 801—821).—With a modification of the Maxwell-Loschmidt method, the diffusion coefficient for the two gases, argon—helium, has been found to be 0·25405 at 15° and 760 mm. pressure, and the value calculated by Meyer's formula agrees very closely with this, only, however, so long as the numerical ratio of the molecules of the two gases is equal to unity. J. C. P.

Stability of the Equilibrium of Bivariant Systems. PAUL SAUREL (*J. Physical Chem.*, 1904, **8**, 436—439).—The following theorem is established. If in a univariant system of $n+1$ phases at constant pressure and temperature a reversible change which increases the entropy causes the i-th phase to increase, then the bivariant system in which this phase is missing cannot exist in stable equilibrium at the given pressure at a higher temperature, nor at the given temperature at a greater pressure. L. M. J.

Equilibrium $CO + H_2O = CO_2 + H_2$. O. HAHN (*Zeit. physikal. Chem.*, 1904, **48**, 735—738).—In a previous paper (Abstr., 1903, ii, 274), the author arrived at an equation connecting K, the equilibrium constant of the above reaction, with T, the absolute temperature, and showed that the calculated values of K agreed well with the observed values, except at high temperatures. If, however, the actual molecular heats (constant pressure) as calculated by Le Chatelier (*Zeit. physikal. Chem.*, 1887, **1**, 456) are taken instead of the mean molecular heats (constant volume), better agreement is obtained. The equation for K then becomes $\log K = -2226/T - 0·0003909T + 2·4506$. J. C. P.

Thermochemistry and Acidimetry of Methylarsonic Acid. A. ASTRUC and E. BAUD (*Compt. rend.*, 1904, 139, 212—215).—Addition of one molecule of sodium hydroxide to one molecule of methylarsonic acid, H_2MeAsO_3, in dilute aqueous solution develops 15·43 Cal., a second molecule of the hydroxide develops 11·93 Cal., whilst the addition of a third molecule produces no thermal effect. The heats of solution of methylarsonic acid and of the anhydrous monosodium and disodium salts (1 mol. in 6 litres) are respectively $-2·86$ Cal., $+8·60$ Cal., and $+19·89$ Cal. From these numbers, the following heats of reaction are calculated :

H_2MeAsO_3 (solid) + Na (solid) = H (gas) + $NaHMeAsO_3$ (solid) + 46·37 Cal.

$NaHMeAsO_3$ (solid) + Na (solid) = H (gas) + Na_2MeAsO_3 (solid) + 43·04 Cal.

Methylarsonic acid is monobasic towards litmus or rosolic acid and dibasic towards Poirrier blue (compare Abstr., 1902, ii, 370).

The monosodium salt crystallises with $3H_2O$, and the disodium salt with $6H_2O$, the heat of hydration of the latter being $+24·36$ Cal.

H. M. D.

Heat of Formation of Antimony Trisulphides. JOSEPH GUINCHANT and PAUL CHRÉTIEN (*Compt. rend.*, 1904, 139, 288—289. Compare this vol., ii, 568).—A reply to Berthelot (compare this vol., ii, 605).

M. A. W.

Catalytic Reactions at High Temperatures and Pressures. VIII. WALDIMIR N. IPATIEFF (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 786—813; *Ber.*, 1904, 37, 2961—2985. Compare Abstr., 1903, i, 453, 593, 594, 595, and 598).—Investigation of the decomposition of alcohols at high temperatures and pressures, in the presence of iron as catalyst, leads to the conclusion that increase of pressure diminishes the decomposability of alcohols, and although the course of the reaction is the same as under the ordinary pressure, yet the products of the reaction—especially the gases formed—differ in composition from those obtained under atmospheric pressure. The substances examined were methyl, ethyl, propyl, and amyl alcohols, aldehyde, *iso*propyl alcohol, acetone, and dimethylethylcarbinol.

The decomposition of primary, secondary, and tertiary alcohols differs as regards both the products formed and the velocity, which may be taken as approximately proportional to the rate of increase of pressure. Curves showing the increase of pressure with time were constructed and the maximum values of dP/dT determined; it is found that the product of this maximum value, with the time after which it is arrived at, is a constant: $(dP/dT)_{\max}.T = $ a constant $= R$. This constant R holds moderately well, not only at different temperatures for one and the same alcohol, but for all primary alcohols, and may serve as roughly representing the relative amounts of energy transformed by different catalysts in the complete decomposition of organic compounds.

The geometrical representation of the above relation will be a rectangular hyperbola, in which the product of the co-ordinates is a constant. For primary alcohols, the value of R is about 800 (using the atmosphere and minute as units), and in the decomposition two processes take place: (1) formation of hydrogen and aldehyde and (2) resolution of the latter into a saturated hydrocarbon and carbon monoxide. For secondary alcohols and for aldehydes (where only one reaction takes place) the value of R is only half as great.

In the decomposition of primary and secondary alcohols in presence of catalytic iron under high pressures, no separation of carbon is observed such as is met with under the ordinary pressure, and all alcohols at high temperatures undergo a special decomposition, to which the name paraffinoid may be given, as the gases formed consist mainly of saturated hydrocarbons. T. H. P.

Catalytic Reactions at High Temperatures and Pressures. Dissociations in the Phenomena of Catalysis. IX. Wladimir N. Ipatieff (*J. Russ. Phys. Chem. Soc.*, 1904, **36**, 813—835; *Ber.*, 1904, **37**, 2986—3005. Compare preceding abstract).—Investigation of the decomposition, in presence of alumina as catalytic agent, of alcohols in closed vessels under high pressures and at definite temperatures shows that the alcohols undergo decomposition into olefines and water, just as is the case under the ordinary pressure; the temperatures at which the catalytic decompositions occur are, however, higher than under atmospheric pressure. But it is found that, at temperatures lower than those at which the olefines are formed from primary alcohols, one molecule of water is given up by two molecules of alcohol, an ether being formed. This reaction is reversible, the ether again yielding the alcohol under the influence of alumina. At higher temperatures, the ether undergoes further decomposition into olefine and water. At still higher temperatures, the olefine, and also the aldehyde formed by the hydration of the ether, are decomposed, yielding gaseous products partially similar to those formed during catalysis by iron.

The pressure curves for certain primary, secondary, and tertiary alcohols and ethyl ether have been constructed and the values of R determined free (preceding abstract); these are found to have about half the corresponding values for catalysis with iron.

Moreover, under the ordinary pressure, ethyl ether is formed in the decomposition of ethyl alcohol, but only in very small quantities; in the same way, ethyl alcohol is always formed in the catalytic decomposition of ether under the influence of alumina under the ordinary pressure. T. H. P.

Question of the Accurate Determination of Molecular Weight from the Vapour Density. Max Reinganum (*Zeit. physikal. Chem.*, 1904, **48**, 697—712).—In reference to Ramsay and Steele's paper dealing with this subject (Abstr., 1903, ii, 635), the author shows that with the help of his own equation of condition for gases under low pressures (*Ann. Physik*, 1901, [iv], **6**, 533), the data obtained by these workers and those obtained for *iso*pentane by Young (Abstr., 1899, ii, 633) give very good values for the molecular weight. Further, with the aid of the law of corresponding conditions, it is shown that the results of Ramsay and Steele are in harmony with those of Young, so far as the extent of the deviations from the gas laws exhibited by vapours is concerned. As shown in the paper, these deviations may be very simply measured by the use of Hoffmann's method. J. C. P.

Determination of Vapour Density from Increase of Pressure and the Accuracy of this Method as compared with that of Known Methods. W. HAUPT (*Zeit. physikal. Chem.*, 1904, 48, 713—724).—The author describes an apparatus, consisting essentially of a glass globe provided with a brass cap and connected with a manometer, which permits the measurement of the increase of pressure caused by the vaporisation of a known weight of a liquid in a given space. The liquid is contained in a small glass bottle and placed until required in an air-tight chamber attached to the brass cap. The accuracy obtainable by this method is shown to be in no way inferior to that of the other known methods [compare Lumsden's method, Trans., 1903, 83, 342, to which no reference is made]. J. C. P.

Melting Point Diagram for Mixtures of N_2O_4 and NO. N. M. WITTORFF (*J. Russ. Phys. Chem. Soc.*, 1904, 36, 857—863).—On saturating liquid nitrogen peroxide with nitric oxide and subsequently cooling the solution, dark blue crystals of nitrous anhydride melting at $-103°$ separate; no other compound is formed. The eutectic mixture of N_2O_4 and N_2O_3 melts at $-112°$. It is probable that nitric oxide does not dissolve nitrous anhydride, but that the relation between them is similar to that between water and benzoic acid. T. H. P.

Relative Viscosity of Liquids. KARL BECK (*Zeit. physikal. Chem.*, 1904, 48, 641—681).—By a method of which full details are given, the viscosity of fresh human blood has been determined and at 38° found to be about five times as great as that of water.

The viscosities of a number of compounds have been determined at temperatures just above their freezing points in order to study the effect of differences in constitution. The viscosity constants of the isomorphous compounds, dibenzyl, azobenzene, benzylideneaniline, benzylaniline, and stilbene are very closely related. For isomorphous mixtures of these compounds, the viscosity varies in a linear manner provided the freezing point is the same as that calculated by the mixture rule. In cases where the latter condition is not fulfilled, the viscosity curve exhibits a maximum where the freezing point curve has a minimum.

Study of the viscosity shows that inactive mixed crystals of optical antipodes break up on melting into a mixture of the two antipodes. The two racemic compounds, tartaric acid and methyl diacetyltartrate, have been shown to break up similarly on melting, so that the melting point is also a transition point.

The behaviour of the oximes of benzaldehyde and anisaldehyde supports the view that the α-oximes occur in two monotropic forms, of which the one with the lower melting point has been obtained through the hydrate.

The two liquids obtained by melting the monotropic forms of iodine monochloride are exactly the same so far as the viscosity constant is concerned. J. C. P.

Fluidal Metals. P. Duhem (*J. Chim. Phys.*, 1904, ii, 438—446).—It has been shown by Spring (this vol., ii, 313) that metals under great compression assume an allotropic form, which he terms the "fluidal" metal (*mêtal flué*) as distinct from the ordinary form obtained by cooling the molten metal, which he terms the "annealed" metal (*mêtal recuit*). As annealed and fluidal bismuth form a couple in which the fluidal metal is the cathode, it follows that at the ordinary temperature and pressure the fluidal bismuth is in true equilibrium and the annealed bismuth in pseudo-equilibrium. At high temperatures, however, the fluidal metal is transformed into the annealed, whilst under high pressures the annealed form passes into the fluidal bismuth, the transformation of annealed to fluidal bismuth being accompanied by the development of heat. From these data, it is clear that the equilibrium curve between the two forms, when represented as a diagram with pressure ordinates and temperature abscissæ, consists of a curve ascending from left to right and cutting the axis of zero pressure at an elevated temperature. On each side of this curve lie the fields of pseudo-equilibrium, and beyond the regions of transformation. For other metals, if the reversible transformation is endothermic, the curve will be of the same form, but for all examined hitherto they cut the horizontal axis ($T=0$) under an elevated pressure. If the transformation is endothermic, the curve descends from left to right. L. M. J.

Hard and Soft States in Metals. G. T. Beilby (*Electro-Chem. Metall.*, 1904, 3, 806—819. Compare *Proc. Roy. Soc.*, 1902, 72, 218—225; *J. Soc. Chem. Ind.*, 1903, 1166—1177).—In continuation of previous work, the author brings forward evidence showing that metals occur ordinarily in two distinct solid phases: (1) the hardened or amorphous phase; (2) the annealed or crystalline phase. The former is converted into the latter by the agency of heat, the latter into the former by mechanically produced flow. The photomicrographs obtained make it probable that two intermediate mobile phases also exist. In this study of the phenomena of hardening and softening, both malleable ductile metals, such as gold, silver, platinum, copper, and lead, and brittle crystalline metals, such as antimony and bismuth, have been investigated, and it is found that flow takes place in all cases. As shown in detail for the case of silver, the different mechanical, optical, electrical, and thermochemical properties associated with the hard and soft forms of metals respectively group themselves on either side of a transition temperature common to all, hence these two forms of a metal may be regarded as two distinct phases. The transformation from hard to soft is thermally irreversible, that is, mere lowering of the temperature below the transition point does not bring about the reverse change from soft to hard. Hardening, on the other hand, occurs whenever work is done on the crystalline phase, and, as shown by the photomicrographs, this hardening is accompanied by the disappearance of crystalline, and the appearance of vitreous and granular character. This effect is strictly confined to the surface in cases where the hardening has been produced by polishing, but extends to a greater depth where the mechanical treatment has consisted in beating, rolling, or pressing. When a piece of metal is strained, there is relative displacement and mutual friction of the crystalline grains, resulting in the formation of an encasing network of the hardened phase. Thus the tensile strength of a wire increases when its diameter is reduced by drawing. The transition temperatures referred to above have been approximately determined by a softening test, with the following results: silver began to soften at 230°, and was completely soft at 265°; the two corresponding temperatures found for gold were 250° and 280°; for copper, 250° and 290°; for magnesium, 300° and 360°. J. C. P.

The Permanence of Crystallitic Forms in Crystals. Floris Osmond and G. Cartaud (*Compt. rend.*, 1904, **139**, 404—406).—The lack of homogeneity in microsections of bronzes containing 9—10 per cent. of tin, when treated with a suitable etching fluid, has been explained on the basis of the laws of solidification of solutions. The sharpness of the crystalline contours is, however, difficult to account for, and the authors point out that the mechanical operations involved in the production of the section contribute to produce the appearances observed. A method of preparing sections is described in which the disturbing effects of the mechanical operations are eliminated.

H. M. D.

The Fundamental Law of Osmotic Phenomena. E. Ariès (*Compt. rend.*, 1904, **139**, 196—198).—A simple thermodynamic proof is given, showing that, if a solution at a given temperature and under a pressure p_1 is in osmotic equilibrium with the pure solvent at the same temperature and under a pressure p_2, the thermodynamic potential of the pure solvent is the same as that of the solvent in the solution (compare this vol., ii, 16). H. M. D.

Theory of Dilute Solutions based on the Law of van't Hoff. E. Ariès (*Compt. rend.*, 1904, **139**, 401—404).—Making use of the fundamental law of dilute solutions, the author deduces, in a simple manner, values for the thermodynamic potential of the solvent and the dissolved substance present in a solution. H. M. D.

Some Physical Constants of Saturated Solutions. I. Earl of Berkeley (*Phil. Trans.*, *A*, 1904, **203**, 189—215).—The densities and solubilities of the following salts have been determined at temperatures between 0° and the boiling points of the saturated solutions: chlorides, sulphates, and nitrates of sodium, potassium, rubidium, cæsium, and thallium, also potassium, rubidium, cæsium, and thallium alums. Full details are given of apparatus and methods.

J. C. P.

The Constitution of Dissolved Salts. Albert Colson (*Compt. rend.*, 1904, **139**, 199—201).—The phenomena observed on precipitating zinc sulphate solutions with alkali cannot be completely explained in a satisfactory manner on the assumption that the dissolved sulphate is represented by the formula $ZnSO_4$.

When baryta is gradually added in excess to a zinc sulphate solution, the ordinary equation, $ZnSO_4 + Ba(OH)_2 = BaSO_4 + Zn(OH)_2$, does not represent the actual facts observed (compare this vol., ii, 377 ; ii, 532). The dissolved zinc sulphate (copper sulphate behaves similarly) apparently behaves like a weak acid and dissolves zinc hydroxide ; to account for this, the author proposes that the dissolved salt should be represented by a formula of the type $H{\cdot}SO_4{\cdot}Zn{\cdot}OH$. The fact that the precipitate which separates from solution on addition of baryta contains 1 mol. $ZnSO_4$ for 3 mols. $BaSO_4$ leads the author to double this formula, and the dissolved zinc sulphate is then represented by $H{\cdot}SO_4{\cdot}Zn{\cdot}O{\cdot}Zn{\cdot}SO_4{\cdot}H$, a complex molecule containing two hydrogen atoms with acid functions. H. M. D.

Modification of the Freezing Point Method. STEWART W. YOUNG and W. H. SLOAN (*J. Amer. Chem. Soc.*, 1904, 26, 913—922).—In the authors' method, the stirrer consists of a cylinder of ice by means of which the pure solvent (water) is agitated whilst its melting point is taken ; a known weight of the solute is then added, the solution obtained is thoroughly stirred with the ice stirrer, whilst the vessel containing the solvent is surrounded by a freezing mixture. The temperature is read when equilibrium is reached, the thermometer and ice stirrer being then removed. The freezing vessel, which is an ordinary cylindrical vacuum jacket, is taken from the freezing mixture and weighed, and as the weight of the solute is known, that of the solvent is obtained. A series of determinations with increasing concentration may be made by successively adding more of the solid, stirring in each instance with the ice stirrer and again noting the temperature and weight as before. The principle is thus somewhat similar to that adopted in Landsberger's boiling point apparatus. A mechanical method for agitating the stirrer was employed.

W. A. D.

Concentration of Metallic Ions in Silver Nitrate Solutions containing Albumin. G. GALEOTTI (*Zeit. physiol. Chem.*, 1904, 42, 330—342).—The concentration of the metallic ions in a silver nitrate solution containing albumin has been determined by the Poggendorf-Ostwald method, using the equation $\log C_k = \log C_o - E/0{\cdot}0575$, where C_k is the concentration required, C_o the concentration of silver ions in an $N/10$ solution of silver nitrate, and E the *E.M.F.* of a concentration cell, using the solution under investigation, N/10 silver nitrate and silver electrodes, the two solutions being connected by a strip of dry filter paper.

The results show that the presence of egg-albumin considerably lessens the number of silver ions ; the concentration of these ions is extremely low when the system consists of a single phase (solution and no precipitate), but is much higher when the system consists of two phases (solution and precipitate.).

If the amounts of water and silver nitrate are kept constant in a series of experiments and the amount of albumin varied, the concentration of the silver ions diminishes rapidly and according to a fixed law for small amounts of albumin; a sharp break then occurs and the concentration of the silver ions diminishes less rapidly as the albumin is increased and approximates a limiting value, which is the same however large the amount of albumin present may be. The results may be represented in the form of a curve with $\log C_k$ and amounts of albumin as ordinates.

The law governing the relationships of the concentrations of albumin, silver nitrate molecules, and silver ions in a two-phase system can readily be derived, by the aid of Jahn's equation (Abstr., 1902, ii, 597), when account is taken of the mutual actions of the dissolved molecules. These mutual actions are so considerable that they considerably modify the solubility of the albumin and the ionisation of the silver nitrate. J. J. S.

Toxins and Antitoxins from the Physico-chemical Point of View, and the Laking of Red Corpuscles. Hans Koeppe (*Pflüger's Archiv*, 1904, 103, 140—148. Compare Abstr., 1903, ii, 736; Arrhenius and Madsen, *ibid.*, 561).—Attention is drawn to the fact that Arrhenius and Madsen's method led to a number of experimental errors which the author had not encountered in similar researches. It is shown that these were largely due to the fact that the hæmolytic agent or alkali was added to the blood emulsion instead of *vice versâ*.

The author adheres to the conclusion that laking in alkaline liquids is due to the concentration of hydroxyl ions in such solutions.

J. J. S.

Flocculation of Colloids and Bacteria Agglutination. H. Bechhold (*Zeit. physikal. Chem.*, 1904, 48, 385—423).—The rate of flocculation depends, within certain limits, on the concentration. When the concentration decreases to a certain point, flocculation practically ceases; whilst above a certain degree of concentration the rate of flocculation is more or less independent of concentration.

There is no essential difference between the flocculation of bacteria and colloids, &c.

The flocculation of unorganised suspensions is hindered by colloids (gelatin, &c.). This is not due to increased viscosity, but to the particles becoming enveloped by the colloid. The suspensions then behave like colloids.

Bacteria, like all true suspensions, travel to the anode.

N. H. J. M.

Agglutination. Wilhelm Biltz (*Zeit. physikal. Chem.*, 1904, 38, 615—623).—It is proposed to prepare mixtures of inorganic colloids with agglutins and with bacteria respectively, and to ascertain whether these substances act in accordance with the observations of Eisenberg and Volk (*Zeit. Hygiene*, 1902, 40, 155. Compare also Arrhenius, Abstr., 1903, ii, 356). It should also be ascertained whether inorganic colloids exist which behave like antitoxins. N. H. J. M.

New Electric Furnace and Various Other Electric Heating Appliances for Laboratory Use. HARMON N. MORSE and J. C. W. FRAZER (*Amer. Chem. J.*, 1904, 32, 93—119).—In attempting to devise a method for the direct measurement of osmotic pressure (Abstr., 1901, ii, 543; 1902, ii, 553; 1903, ii, 272), considerable difficulty has been experienced in the production of a suitable osmotic cell. It has been found that the failure of these cells is largely due to the production of comparatively large channels in the wall by the escaping steam during the baking of the clay. In order to avoid the formation of these channels, it is necessary that the temperature should be very carefully regulated during the period in which the clay loses most of its water. An electric furnace has therefore been devised for baking the cells, which is capable of being maintained at any desired temperature, and a smaller form has been designed for ordinary laboratory purposes, such as the fusion of silicates in crucibles. The furnace is calibrated by determining its resistance for all temperatures up to the maximum required, in order that it may be possible to maintain any desired temperature or to ascertain at any time the temperature attained. The furnace described by the authors was calibrated for temperatures between 383° and 967°. A detailed description of the furnace and the method of constructing it is given and illustrated with diagrams.

An accurately calibrated electric furnace is well adapted for the study of reactions at high temperatures, but in order to obtain a high degree of accuracy it is necessary to reduce as far as possible the length of time required to establish equilibrium between the temperature within the furnace and that of the external air. This can be accomplished by coating the outside of the furnace with graphite, a substance which conducts electricity and the conductivity of which increases with rise of temperature. The circuit is divided, so that whilst the greater part of the current passes through the furnace, another portion passes over and heats the surface in contact with the air. By this means, compensation is automatically made for the increased loss of heat to the external air which attends any rise in the temperature of the furnace, for as the temperature rises the conductivity of the circuit through the furnace diminishes, whilst that of the outer circuit increases, and a larger proportion of the current therefore takes the latter course. This principle has been applied in the construction of graphite stoves for use as hot air-baths, a furnace for heating sealed tubes, and a bath with platinum stove for heating rather large vessels at any temperature up to 500°. For the details of these various forms of apparatus, the description and diagrams in the original must be consulted. E. G.

Apparatus for the Determination of High Melting Points. FR. KUTSCHER and OTORI (*Zeit. physiol. Chem.*, 1904, 42, 193—194).—The apparatus consists essentially of a double-walled air-bath. The thermometer and tube with substance are fitted into a glass test-tube and this is placed in a silica flask which can be heated either directly or on asbestos. If the tube containing the substance is made wide and of a conical shape, temperatures of explosion may be determined without risk. J. J. S.

Press for the Preparation of Pellets. PAUL FREUNDLER (*Bull. Soc. chim.*, 1904, [iii], 31, 815—816).—In the screw presses in general use for the preparation of pellets for physico-chemical determinations, the piston is apt to become twisted after a time, so that it no longer fits accurately into the mould. It is proposed to remedy this defect by inserting, between the head of the piston and the end of the screw by which the pressure is applied, a cross-piece which slides vertically on the frame of the press. By this means, direct contact of the screw with the piston is avoided and the latter remains perfectly vertical. The apparatus is figured in the original. T. A. H.

Inorganic Chemistry.

Viscosities of Oxygen, Hydrogen, Chemically Pure and Atmospheric Nitrogen, and the change of these with the Temperature. HERMANN MARKOWSKI (*Ann. Physik*, 1904, 14, 742—755).—The viscosity coefficients of oxygen, hydrogen, and nitrogen have been determined at temperatures between 0° and 183° by a method similar to that employed by Schultze (*Ann. Physik*, 1901, [iv], 5, 140) and Breitenbach (*ibid.*, 166). The variation of the coefficient with temperature is given satisfactorily by Sutherland's formula. Except in the case of hydrogen, the temperature-coefficient of the viscosity constant diminishes as the temperature rises. The viscosity constant for atmospheric nitrogen can be satisfactorily calculated from those for argon and chemically pure nitrogen with the aid of Puluj's formula. J. C. P.

Absorption of Gases by Wood Carbon at Low Temperatures. Sir JAMES DEWAR (*Compt. rend.*, 1904, 139, 261—264).—The power of absorption of cocoa-nut charcoal for gases (compare Dewar and Tait, *Proc. Roy. Soc. Edin.*, 1875, 8, 348) is largely increased at the temperature of liquid air, and the coefficient of absorption at this temperature has been determined; for this purpose, the charcoal is placed in a small glass tube supplied with a stopcock, the air is removed from the tube and charcoal by means of an air pump, and the stopcock closed, the tube is then placed in a liquid air calorimeter, and connected with a graduated vessel containing the gas under investigation; the stopcock is opened and the amount of gas absorbed and the heat developed in the process are measured; the results are embodied in the following table:

	Volume absorbed at 0°.	Volume absorbed at −185°.	Heat developed in gram-calories.
Hydrogen	4 c.c.	135 c.c.	9·3
Nitrogen	15 ,,	155 ,,	25·5
Oxygen	18 ,,	230 ,,	34
Argon......................	12 ,,	175 ,,	25
Helium	2 ,,	15 ,,	2
Electrolytic gas.........	12 ,,	150 ,,	17
CO + O	30 ,,	195 ,,	34·5
Carbon monoxide	21 ,,	190 ,,	27·5

When cocoa-nut charcoal, at −185°, is saturated with pure dry air, it absorbs the oxygen more readily than the nitrogen, the gas recovered at 15° containing 56 per cent. of oxygen; further, if the absorbed gas is allowed to escape gradually, it is possible to effect a partial separation of the two constituents, the first fraction containing 18·5 and the sixth 84·0 per cent. of oxygen. M. A. W.

The State of Vaporised Carbon. Marcellin P. E. Berthelot (*Ann. Chim. Phys.*, 1904, [viii], 2, 185—192).—A *résumé* of work already published (compare this vol., ii, 27). M. A. W.

Preparation of Sulphurous Acid for Use as a Reagent. Louis L'Hôte (*Ann. Chim. anal.*, 1904, **9**, 305).—A washed current of sulphur dioxide generated from charcoal and sulphuric acid is passed into a small bottle previously heated, and by means of a funnel boiling water is introduced and the delivery tube is gradually withdrawn. After the bottle is completely filled and saturated with the gas, it is at once closed.

In this manner, a solution is obtained perfectly free from sulphuric acid. L. de K.

Complex Thiosulphates. Owen Louis Shinn (*J. Amer. Chem. Soc.*, 1904, **26**, 947—952).—On adding concentrated aqueous sodium thiosulphate to an ammoniacal solution of a copper salt, a blue, crystalline substance separates, which seems to be an *ammonio-cuprous sodium ammonium thiosulphate*, $3Cu_2S_2O_3,4Na_2S_2O_3,(NH_4)_2S_2O_3,6NH_3$, as it is also obtained by the addition of aqueous sodium thiosulphate to cuprous oxide dissolved in ammonia; when dry, it is moderately stable in the air, but when moist it rapidly oxidises. It is partly decomposed by water.

Ammonio-cuprous silver sodium thiosulphate,

$$Cu_2S_2O_3,2Ag_2S_2O_3,5Na_2S_2O_3,6NH_3,$$

obtained by adding aqueous sodium thiosulphate to a solution of mixed copper and silver salts in ammonia, crystallises in tetragonal pyramids ($a:c = 1:0·8375$) and appears to be isomorphous with the foregoing salt. W. A. D.

Reaction between Carbon Dioxide and Soluble Nitrites. Richard B. Moore (*J. Amer. Chem. Soc.*, 1904, **26**, 959—961).—As bearing on the controversy between Meunier and Marie and Marquis (compare this vol., i, 208; ii, 252, 333), it is shown that carbon dioxide carries off nitrous acid when passed through a solution of potassium or sodium nitrite (compare Moody, *Proc.*, 1903, **19**, 240).

W. A. D.

Action of Ammonia on Boron Bromide and on Phosphorus Trichloride. ALEXANDRE JOANNIS (*Compt. rend.*, 1904, **139**, 364—366. Compare Abstr., 1903, ii, 140).—When dry ammonia acts on boron bormide at 0°, borimide is produced according to the equation $2BBr_3 + 27NH_3 = 6(NH_4Br,3NH_3) + B_2(NH)_3$. If the temperature is allowed to rise to 20°, the ammoniacal ammonium bromide dissociates, and 9 mols. of ammonia are evolved for each molecule of boron bromide used.

When the vapour of phosphorus trichloride is led by means of a current of dry hydrogen into liquefied ammonia at −78°, the following reaction takes place:

$$PCl_3 + 14NH_3 = 3(NH_4Cl,3NH_3) + NH{:}P{\cdot}NH_2.$$

The constancy of the reacting proportions points to the formation of the amino-imino-compound, but the product may be a mixture of the amide and the imide. When the temperature rises to 0°, the ammoniacal complex dissociates, and 9 mols. of ammonia are evolved for each mol. of the phosphorus trichloride. Between 0° and 100°, a further quantity of ammonia is evolved (1 mol. for 2 mols. PCl_3), corresponding with the equation $2NH{:}P{\cdot}NH_2 = NH_3 + P_2(NH)_3$.

H. M. D.

Melting Points of Mixtures of the Alkaline Earths with Boric Anhydride. W. GUERTLER (*Zeit. anorg. Chem.*, 1904, **40**, 337—354. Compare this vol., ii, 610, 614).—The melting point curves of calcium, strontium, and barium oxides respectively with boric anhydride are represented. Curves are also shown to represent the concentration of the molten masses of mixtures of those oxides saturated with boric anhydride at temperatures varying from 0° to 1400°. The author was unable to confirm the existence of Ditte's compounds, $2MO,3B_2O_3$ and $3MO,2B_2O_3$. When concentrations corresponding to the compounds $2CaO,3B_2O_3$, $2SrO,3B_2O_3$, $2BaO,3B_2O_3$ are chosen, the crystallisation takes place almost at a constant temperature with the formation of a eutectic mixture. The author's results, however, confirm the existence of Ditte's compounds, $2CaO,B_2O_3$ and $2SrO,B_2O_3$. Calcium diborate and strontium diborate show a very slight tendency to crystallise spontaneously; barium diborate could not be obtained crystalline.

The existence of the metaborates, CaB_2O_4, SrB_2O_4, and BaB_2O_4, is confirmed. Calcium metaborate and strontium metaborate crystallise in long needles exhibiting double refraction, whilst barium metaborate forms flat prisms. Calcium, strontium, and barium pyroborates form finely-crystalline, marble-like masses.

The existence of barium orthoborate was proved.

The following borates are capable of existence:

	Mg.	Ca.	Sr.	Ba.
Orthoborate	$3MgO,B_2O_3$	$(3CaO,B_2O_3)$?	$(3SrO,B_2O_3)$?	$3BaO,B_2O_3$
Pyroborate	$2MgO,B_2O_3$	$2CaO,B_2O_3$	$2SrO,B_2O_3$	$2BaO,B_2O_3$
Metaborate	—	CaO,B_2O_3	SrO,B_2O_3	BaO,B_2O_3
Diborate ...	—	$CaO,2B_2O_3$	$SrO,2B_2O_3$	$BaO,2B_2O_3$

A. McK.

Action of Water and Saline Solutions on Certain Slightly Soluble Phosphates. FRANK K. CAMERON and L. A. HURST (*J. Amer. Chem. Soc.*, 1904, 26, 885—913).—Water does not dissolve the phosphates of tervalent iron, aluminium, and calcium as such, but hydrolyses them to a slight extent; the action takes place slowly, so that in none of the experiments recorded, even although in some cases the phosphate was shaken with water for 30—80 days, was a final condition of equilibrium attained. Free acid accumulates in the solution, whilst the corresponding base is largely precipitated. Although the phosphoric acid in solution tends to increase the solubility of the phosphate, the small amount of dissolved base appears to exercise a greater influence in the opposite direction, so that the addition of increasing amounts of water produces a relatively smaller, although actually larger, decomposition of the phosphate. The diminution in solubility of calcium phosphate caused by the presence of calcium chloride or nitrate corresponds with this view of the foregoing changes, but the increased solubility of aluminium and ferric phosphates caused by aluminium and iron salts respectively (Schneider, Abstr., 1893, ii, 573; 1895, ii, 112) is not in accord with it, unless one assumes that in this case the free acid produced by the hydrolysis of the added salts aids the decomposition.

The presence of potassium chloride decreases the amount of phosphoric acid split off by water from ferric, aluminium, or calcium phosphate, but increases the quantity of iron, aluminium, or calcium entering into solution. Potassium sulphate, on the other hand, increases the amount of phosphoric acid in the case of ferric phosphate, but diminishes it in that of aluminium phosphate. Sodium nitrate diminishes the amount of acid hydrolysed from ferric and aluminium phosphates, but appears to cause an increase in the case of calcium phosphate; an increase in the amount of calcium in solution in the last case undoubtedly occurs.

The acidity of pure aqueous solutions of the phosphates seems to be roughly proportional to the quantity of phosphoric acid found in the solution, but in presence of soluble salts a connection between the acidity and the dissolved phosphoric acid cannot be recognised. Thus, sodium nitrate, potassium chloride, and potassium sulphate all increase the acidity of solutions in contact with ferric phosphate, whilst the first two of these salts decrease the amount of the dissolved phosphoric acid. No connection can be traced between the acidity and the amount of iron in solution, although the quantity of base in solution is increased. In the case of calcium phosphate, potassium chloride and sodium nitrate decrease the acidity instead of increasing it, as with ferric phosphate; in both cases, however, the quantity of calcium in solution decidedly increases, and, in the case of sodium nitrate, the phosphoric acid increases also. In all the experiments which were made to ascertain the influence of temperature, a rise in temperature increased the proportion of decomposition of the phosphate both with aqueous and saline solutions. W. A. D.

Action of Chloric Acid on Metals. Walter S. Hendrixson (*J. Amer. Chem. Soc.*, 1904, 26, 747—758).—The chloric acid used by the author could be heated to 95° without undergoing any considerable amount of decomposition.

Sodium and potassium amalgam have a slight reducing action on chloric acid. With magnesium, about 1/20th of the amount used acted in reducing the chloric acid, the remainder dissolving to form the chlorate with the evolution of an approximately equivalent quantity of hydrogen. With chloric acid of $2N$-strength, the amount of hydrogen set free by its action on zinc is much smaller than when N-chloric acid is used, whilst the amount of acid reduced is correspondingly greater.

The amount of hydrogen evolved by the action of $2N$-chloric acid on aluminium was measured; the aluminium was completely dissolved. Iron dissolves readily in dilute or strong chloric acid without evolution of hydrogen or any other gas, the acid being very readily reduced. No hydrogen is evolved by the action of tin on chloric acid; the tin is dissolved by the acid. The behaviour of copper and of cadmium is similar to that of tin, no hydrogen being evolved in either case. Mercury and antimony are attacked very slowly; nickel dissolves readily, whilst the action on bismuth is slow. Arsenic dissolves to form arsenic acid.

Bromic acid acts on silver according to the equation: $6Ag + 6HBrO_3 = 5AgBrO_3 + AgBr + 3H_2O$ (compare Hendrixson, Abstr., 1903, ii, 596). A. McK.

Action of Ammonium Chloride on Certain Chlorides. I. Action on Metallic Chlorides. Peter Fireman (*J. Amer. Chem. Soc.*, 1904, 26, 741—747).—When antimony pentachloride is heated with ammonium chloride at 380—410°, the reaction is represented by the equation $3SbCl_5 + 2NH_4Cl = 3SbCl_3 + 8HCl + N_2$. When ammonium chloride is heated with titanium tetrachloride at 260—410°, scarcely any gaseous products are evolved, but a greenish-yellow, solid double salt is formed. The reaction between ferric chloride and ammonium chloride, at 400—420°, probably takes place according to the equation $3FeCl_3 + NH_4Cl = 3FeCl_2 + 4HCl + N$, since the amount of gas evolved is in agreement with the action thus represented. Similarly, the amount of gas evolved when cupric chloride is heated with ammonium chloride indicates that the reaction is represented as follows: $3CuCl_2 + NH_4Cl = 3CuCl + 4HCl + N$. No gas is evolved when ammonium chloride is heated with mercuric chloride, a double salt being produced in this case.

Only those metallic chlorides which dissociate more or less readily are reduced to a lower degree of chlorination when heated in a closed tube with ammonium chloride, the latter breaking up completely with elimination of nitrogen. A. McK.

Mutual Rearrangement in Molten Masses of Mixtures of Halogen Salts. Nicolai N. Békétoff [with Wl. Békétoff] (*Zeit. anorg. Chem.*, 1904, 40, 355—371).—In 1859, the author formulated the rule: elements of the same valency distribute themselves in such a manner that positive elements with high atomic weights combine preferentially with negative elements with high atomic weights, whilst positive elements with small atomic weights combine with negative elements with small atomic weights. For example, in the interaction between lithium, cæsium, chlorine, and iodine, with the atomic weights 7, 133, 35·5, and 127 respectively, lithium chloride and cæsium iodide are the main products, since the value $(127 \times 133) + (35{\cdot}5 \times 7)$ is greater than the value $(127 \times 7) + (35{\cdot}5 \times 133)$. The author's views have since been confirmed by Gustavson and Potylizyn in their experiments on the displacement of a halogen element from its salts by means of another halogen.

The author has now examined the heat of solution of a mixture of two alkali haloids, for example, the heat of solution of a mixture of sodium chloride and potassium iodide was first determined, then that of a mixture of sodium iodide and potassium chloride, and, finally, that of the molten mass. When the heat of solution of the individual salt pairs is known, the amount of interchange in the molten mass can be calculated from its observed heat of solution. The fusion of a pure salt does not cause an alteration in its molecular structure of such a nature that the heat of solution is influenced. There was no probability of the formation of double salts in the cases examined. The behaviour of all the possible combinations of lithium, sodium, potassium, and cæsium respectively with chlorine and with iodine was experimentally investigated, and the results found to accord with the author's rule. A. McK.

Sodium Amalgams. A. Schüller (*Zeit. anorg. Chem.*, 1904, 40, 385—399).—The composition of various sodium amalgams was investigated by the author according to Tammann's method (this vol., ii, 113). A weighed quantity of sodium was heated to its melting point and a weighed amount of mercury added. The curves of cooling were determined by mercury in alcohol thermometers, and in some cases by a thermo-element. The various curves are given, the ordinates representing temperatures and the abscissæ concentrations. The times within which the temperatures remained constant are represented by vertical lines, the lengths of which are proportional to the times. The values agree on the whole with Kurnakoff's results, although the temperatures are in most cases higher. The curve exhibits breaks at the following temperatures: −38·6°, −48·2°, 159°, 360°, 227°, 219°, 123°, 66·2°, 33·9°, 21·4°, and 97·5°, corresponding with the following atomic percentages of mercury, 100·0, 2·8 [? 97·2], 81·9, 66·7, 51·9, 49·1, 38·1, 28·2, 15·9, 14·8, 0·0 respectively. The compound $NaHg_2$ exists at 360°, the maximum of the melting point curve, but when mercury is added to this substance, the melting point is lowered, until, at 159°, the compound $NaHg_4$ crystallises. At atomic concentrations of mercury between 97° and 100°, only mercury separates. At 227°, where the atomic concentration of mercury is about 52, the compound $Na_{12}Hg_{13}$

is probably formed. When the atomic concentration of mercury is 50, the compound NaHg separates. When the concentration of sodium is further increased, crystals of the compound Na_3Hg_2 separate from the liquid amalgam. When the temperature sinks to 66·2°, a conglomerate of Na_3Hg_2 and Na_5Hg_2 is produced. At 33·9°, the compound Na_3Hg is formed, whilst at 21·4° a eutectic mixture of Na_3Hg and sodium results. At 97·5°, pure sodium separates.

The preparation of the various amalgams is described. A. McK.

Solubility of Potassium and Barium Nitrates and Chlorides. Harry W. Foote (*Amer. Chem. J.*, 1904, 32, 251—253).—The solubility relations of the double salt, $2KNO_3,Ba(NO_3)_2$ (Wallbridge, Abstr., 1903, ii, 646), have been studied at 25° by means of the method previously described (Abstr., 1903, i, 797). The double salt is stable over a wide range of composition of the solution. Potassium and barium chlorides do not form a double salt at 25°. C. H. D.

Silver Dihydrogen Pyrophosphate. Jacques Cavalier (*Compt. rend.*, 1904, 139, 284—286).—Silver dihydrogen pyrophosphate, obtained by heating a mixture of silver pyrophosphate and pyrophosphoric acid until the liquid is clear, dissolving in a small quantity of water at 0°, and precipitating with alcohol or ether, is a white, crystalline powder, which softens at 150° and melts and decomposes at 240° when heated gradually, whilst the melting point, as determined by Maquenne's metal block process, is 235°. It is decomposed by cold water, yielding the normal salt and pyrophosphoric acid; it reacts with sodium orthophosphate to form silver orthophosphate and pyrophosphoric acid, and with alkyl iodides to form silver iodide and the alkyl esters of pyrophosphoric acid.

M. A. W.

Solubility of Barium and Mercuric Chlorides. Harry W. Foote and Howard S. Bristol (*Amer. Chem. J.*, 1904, 32, 246—251).—The existence of a double salt of barium and mercuric chlorides was sought for by means of the solubility method previously described (Abstr., 1903, i, 797; ii, 728). No double salt was found to exist at 25°. Dilatometric experiments indicated a transition-point at 17·2°. Below this temperature, the salt $BaCl_2,3HgCl_2,6H_2O$ forms, and was detected by the solubility method at 10·4°. Bonsdorf's salt, $BaCl_2,2HgCl_2,2H_2O$ (1829), is not formed under the conditions given by him. C. H. D.

Revision of the Atomic Weight of Glucinum. Charles Lathrop Parsons (*J. Amer. Chem. Soc.*, 1904, 26, 721—740).—The atomic weight of glucinum had hitherto been determined by Nilson and Petterson and others from analyses of the hydrated sulphate, $GlSO_4,4H_2O$, the only other method used being that of Debray, who analysed the double oxalate, $Gl(NH_4)_2(C_2O_4)_2$.

The purification of beryl and of Kahlbaum's hydroxide is first described. A basic carbonate of the approximate composition $GlCO_3.[Gl(OH)_2]_3,2H_2O$ was obtained, which served as a basis for the production of purer salts used in the atomic weight determinations of the author. Kahlbaum's hydroxide contains aluminium and iron along with traces of zinc. Analysis of glucinum chloride is unsuitable for the determination of the atomic weight, owing to the great ease with which it is acted on by water and to the fact that it attacks glass. The author was unable to obtain the compound $GlCl_2,4H_2O$, described by Awdejew.

Atomic weight determinations, based on analyses of the hydrated sulphate, $GlSO_4,4H_2O$, gave values varying from 9·18 to 9·36, but are regarded by the author as unsatisfactory, as the specimens of the hydrated sulphate examined tend to vary in composition owing to the ease with which the water of crystallisation is lost at comparatively low temperatures.

The preparation of pure glucinum acetylacetonate is described. The atomic weight of glucinum was determined by heating the acetylacetonate, first at 50° for 24—48 hours with pure redistilled nitric acid, then for 48 hours at 100°, and, finally, for several hours at 175°. The complete conversion of the nitrate into oxide was finally effected at a bright red heat. The value, obtained in this manner, as a mean of seven determinations, was $9{\cdot}113 \pm 0{\cdot}0059$ (O = 16).

The atomic weight was also determined by the conversion of the basic acetate, $Gl_4O(C_2H_3O_2)_6$, into the oxide, the method being almost identical with that employed for the acetylacetonate. The value $9{\cdot}113 \pm 0{\cdot}0033$ (O = 16) was obtained as a mean of nine determinations.

The atomic weight of glucinum, deduced from these two methods, is accordingly $9{\cdot}113 \pm 0{\cdot}0043$ (O = 16). A. McK.

Glucinum Compounds. II. Preparation of Pure Glucinum Hydroxide. FRITZ HABER and G. VAN OORDT (*Zeit. anorg. Chem.*, 1904, **40**, 465—468. Compare this vol., ii, 257).—Glucinum hydroxide may be separated from aluminium oxide and ferric hydroxide by means of glacial acetic acid, which forms a basic glucinum acetate, very readily soluble in chloroform, from the solution in which it is not extracted by water. Aluminium oxide and iron hydroxide also form compounds with glacial acetic acid, which do not, however, dissolve in chloroform. When the basic glucinum acetate is dissolved in warm acetone and a cold aqueous solution of sodium carbonate then added, glucinum hydroxide is precipitated. A. McK.

Zinc and Cadmium Chromates. MAX GRÖGER (*Monatsh.*, 1904, **25**, 520—536. Compare Abstr., 1903, ii, 647).—The action of an excess of zinc chloride on potassium chromate in aqueous solution (N or $3N$) leads to the formation of a yellow, granular precipitate, which has the composition $4ZnO,K_2O,4CrO_3,3H_2O$. By repeated treatment with hot water, this is converted into the insoluble basic zinc chromate, $ZnCrO_4,3Zn(OH)_2$, which is a dark yellow powder. When fused, the zinc potassium chromate evolves oxygen, the residue consisting of potassium chromate and insoluble violet zinc chromite, $8ZnO,3Cr_2O_3$.

The proportion of potassium, and, to a less extent, that of chromium, is increased by the use of excess of the potassium chromate; with normal solutions, the precipitate has the molecular composition, ZnO, 0·394 K_2O, 1·094 CrO_3; with $3N$ solutions, ZnO, 0·486 K_2O, 1·222 CrO_3. When treated with hot water, these precipitates yield the foregoing basic zinc chromate. These precipitates are of a deeper yellow than that formed in presence of excess of zinc salt, but after prolonged contact (2 weeks) with the mother liquor they assume the colour and composition of the latter.

The action of zinc chloride on sodium chromate leads to the formation of basic zinc chromate, $ZnCrO_4,3Zn(OH)_2$, which is obtained as a horny mass.

Ammonium chromate and excess of zinc chloride give rise to a dark yellow, granular precipitate, ZnO, 0·279 $(NH_4)_2O$, 0·822 CrO_3, which is possibly a mixture, and is decomposed by cold water. The orange-yellow precipitate, formed by the action of an excess of ammonium chromate on zinc chloride, is stable to water or its mother liquor and has the composition $(NH_4)_2CrO_4,ZnCrO_4,Zn(OH)_2$. When strongly heated, it decomposes suddenly, evolving nitrogen and water vapour; the residue is a powder consisting of zinc oxide and chromite, $2ZnO,Cr_2O_3$.

On mixing aqueous solutions of potassium chromate and pure cadmium chloride, a canary-yellow, granular precipitate is formed having the composition $K_2CrO_4,3CdCrO_4,Cd(OH)_2,2H_2O$. Contrary to Preis and Raymann's statement (Abstr., 1880, 444), this same precipitate is formed by the action of cadmium sulphate and potassium chromate. Cadmium potassium chromate is more stable to boiling water than is zinc potassium chromate, but is finally converted into a lemon-yellow powder, 84·53 per cent. of which is cadmium chromite.

On mixing aqueous solutions of cadmium chloride and sodium chromate, a yellow, flocculent precipitate is formed which rapidly becomes granular; it is a basic cadmium chromate which easily loses chromic acid when washed with water and absorbs carbon dioxide when exposed to air. When equal volumes of cadmium chloride and sodium chromate solutions are mixed hot and boiled for three days, during which period the precipitate formed is washed twenty-four times, the residue obtained has the molecular proportion CdO, 0·342 CrO_3, 1·428 H_2O. Cadmium chloride and ammonium chromate interact in aqueous solution, forming a dark yellow precipitate consisting of microscopic prisms and having the composition

$$(NH_4)_2CrO_4,3CdCrO_4,Cd(OH)_2,2H_2O.$$

The action of hot water on the precipitate leads finally to basic cadmium chromate. When heated, cadmium ammonium chromate leaves a green residue containing cadmium and chromic oxide.

G. Y.

Dissociation of Lead Nitrate. J. LIVINGSTONE R. MORGAN (*J. Physical Chem.*, 1904, 8, 416—420).—In the dissociation of lead nitrate according to the equation $Pb(NO_3)_2 \rightleftharpoons PbO + \frac{1}{2}O_2 + 2NO_2$, at any temperature, the value $\sqrt{p_1}.p_2^2$ should be constant; p_1p_2 being the pressures of oxygen and nitric peroxide. From the values obtained by Baekeland for the pressure of lead nitrate at various temperatures, alone and in the presence of excess of nitric peroxide or oxygen, data are obtained to test this constancy. The values so obtained for the constant are

(1) alone, 0·062; (2) in excess of nitric peroxide, 0·098; (3) in excess of oxygen, 0 011 and 0·0091. The author considers that these indicate that the reaction proceeds according to the equation in the first two cases, but that excess of oxygen causes a different action, probably owing to the formation of a basic salt. The heat of dissociation calculated from the vapour pressure is found to agree with the heat of formation calculated from thermochemical data. L. M. J.

The Form in which Thallous Iodide separates from Solution. DESIRÉ GERNEZ (*Compt. rend.*, 1904, 139, 278—281. Compare this vol., ii, 617).—When aqueous solutions of yellow thallous iodide are allowed to cool slowly in the presence of some of the undissolved solid, crystals of the yellow variety, the stable form below 168°, are deposited; if, however, the hot solution is filtered, or cooled rapidly, crystals of the red or unstable form are obtained. Thallous iodide is very sparingly soluble in water, one part dissolving in 16,000 parts of water at 16°, and being even less soluble in alcohol or the other organic solvents; it is, however, more readily soluble in saturated saline solutions, and from such solutions, either filtered or containing excess of the undissolved yellow iodide, the unstable red variety is deposited on cooling, and its conversion into the stable yellow variety is extremely slow, lasting over a period of two years. As regards the deposition of the unstable variety from solutions, thallous iodide resembles mercuric iodide (compare Abstr., 1903, ii, 481).

M. A. W.

Constitution of Hydrated Thallic Chloride. F. M. McCLENAHAN (*Amer. J. Sci.*, 1904, [iv], 18, 104—112).—From the way in which tetrahydrated thallic chloride loses its water in dry air, the formula may be written $TlCl_3,H_2O,H_2O,2H_2O$. At 100°, practically all the water is lost in an hour, and there is very little loss of chlorine. When the salt is heated in hydrogen chloride at varying temperatures up to 100°, the sequence of changes is represented by the following formulæ: $TlCl_3,H_2O,H_2O,2H_2O$; $TlCl_3,H_2O,HCl,2H_2O$; $TlCl_3,H_2O$; $TlCl_3$. A structural formula is written for the hydrated salt in accordance with Cushman's hypothesis of quadrivalent oxygen (Abstr., 1902, ii, 322). L. J. S.

Crystallised Copper Iodates. A. GRANGER and AUGUST DE SCHULTEN (*Compt. rend.*, 1904, 139, 201—203).—When a dilute solution of potassium iodate is added drop by drop to a very faintly acid solution of copper sulphate heated on the water-bath, dark green, orthorhombic crystals of the basic iodate, $CuIO_3{\cdot}OH$, separate. The crystals (sp. gr. 4·878 at 15°) can be heated to 290° without change; at higher temperatures, water, iodine vapour, and oxygen are evolved. Blue, triclinic crystals of the normal iodate, $Cu(IO_3)_2,H_2O$ (sp. gr. 4·876 at 15°), separate when the dilute potassium iodate solution is slowly added to a hot copper nitrate solution containing a considerable quantity of nitric acid. When the hydrated normal iodate is distilled on the water-bath with nitric acid of sp. gr. 1·33, pale green, monoclinic crystals of the anhydrous salt, $Cu(IO_3)_2$ (sp. gr. 5·241 at 15°), are deposited. Addition of potassium iodate solution to the solution of a copper salt containing more than a very small quantity of free acid leads to the formation of both the normal iodate and the basic iodate. Crystallographic measurements of the three salts are recorded.

H. M. D.

Cuprammonium Sulphates. David W. Horn and Edytha E. Taylor (*Amer. Chem. J.*, 1904, 32, 253—285).—Berzelius' cuprammonium sulphate, $CuSO_4,4NH_3,H_2O$, is best prepared by Andrae's method of passing ammonia gas into a solution of copper sulphate and drying over lime. It is stable in dry air, but loses ammonia when moist. On heating at various temperatures, only mixtures containing basic salts are obtained. The salt forms a clear solution in water, but on dilution to 1/20th or 1/25th normal, a permanent precipitate is produced.

C. H. D.

Constitution of Copper Zinc Alloys. E. S. Shepherd (*J. Physical Chem.*, 1904, 8, 421—435).—The author finds that no definite compounds of copper and zinc can exist, but that six different solid phases occur which are all solid solutions. The composition of the solids which can be in equilibrium with different fusions is given, and also the percentage of copper in the crystals at 400°. The latter are: α, 64—100; β, 51—53·5; γ, 31—40; δ, unstable at 400°; ϵ, 13—19; η, 0—2·5. The α-crystals vary in colour from yellow to copper-red, the β-crystals are red, and this explains the red colour of brasses containing 40 to 60 per cent. of copper. The micro-structure of the brasses is also considered, and the paper is illustrated by 46 photomicrographs, which show the crystalline structure as well as the effects of heat and annealing on the different alloys.

L. M. J.

Some Cerium Compounds. Jean Sterba (*Ann. Chim. Phys.*, 1904, [viii], 2, 193—232).—This paper is largely a *résumé* of work already published (compare Abstr., 1901, ii, 602; 1902, ii, 399, 563). Pure cerium sulphide, Ce_2S_3, prepared by the action of hydrogen sulphide on cerium oxide, hydroxide, sulphate, or carbonate at a red heat, does not ignite spontaneously (compare Muthmann and Stützell, Abstr., 1900, ii, 142), but an oxysulphide obtained by the action of moist hydrogen sulphide has this property. Mosander's golden-yellow crystalline cerium sulphide (compare Muthmann and Stützell, Abstr., 1900, ii, 142) is crystallised ferric sulphide.

M. A. W.

Chromate, Dichromate, and Chromic Acid. Richard Abegg and A. J. Cox (*Zeit. physikal. Chem.*, 1904, 48, 725—734).—The addition of soluble barium or silver salts to a solution of a dichromate results in the precipitation of sparingly soluble normal chromates, hence a dichromate solution must contain normal chromate and free chromic acid. The equilibrium may be represented by the equation $Cr_2O_7'' \rightleftarrows CrO_4'' + CrO_3$, and various ways of determining the constant $K = [Cr_2O_7'']/[CrO_4''].[CrO_3]$ are discussed. The knowledge of the solubility product for some of the sparingly soluble normal chromates would furnish one method of evaluating K, but sufficient data are not available. One of the authors (C.) has found that normal mercuric chromate is hydrolysed into a sparingly soluble basic salt, $HgCrO_4,2HgO$, and free chromic acid, which accumulates in the solution until its molecular concentration is 0·706 at 50° and 0·456 at 25°. Thus, using a mixture of normal and basic chromate as a regulator for the concentration of free chromic acid, the authors have found $K = 0·96$ at 50° and $= 1·08$ at 25°. This means that (1) a dichromate solution contains a relatively small quantity of Cr_2O_7'' ions, a result borne out also by freezing point experiments; (2) as the temperature rises, the quantity of Cr_2O_7'' ions diminishes in favour of normal chromate ions and chromic acid. Chromic acid itself is to be regarded as a weak acid, the salts of which are hydrolysed in the usual manner. J. C. P.

Action of Zinc on the Sodium Tungstates. L. A. HALLOPEAU (*Compt. rend.*, 1904, **139**, 283—284. Compare Abstr., 1900, ii, 8).—Delépine (compare Abstr., 1900, ii, 548) has shown that tungsten trioxide or ammonium tungstate is readily reduced by zinc, but the author finds that zinc at its boiling point has no action on sodium tungstate, $Na_2O,WO_3,2H_2O$, whilst under the same conditions sodium paratungstate, $5Na_2O,12WO_3,28H_2O$, yields zinc tungstate, ZnO,WO_3, in the form of large, prismatic crystals, a small quantity of Wöhler's sodium tungsto-tungstate, Na_2O,WO_3,WO_2,WO_3, in the form of golden-yellow scales, and traces of tungsten in the form of a grey, amorphous powder. M. A. W.

Separation of Thorium from Cerium, Lanthanum, and Didymium by *m*-Nitrobenzoic Acid. ARTHUR C. NEISH (*J. Amer. Chem. Soc.*, 1904, **26**, 780—793).—*m*-Nitrobenzoic acid precipitates thorium quantitatively as $Th(NO_2 \cdot C_6H_4 \cdot CO_2)_4$ from a neutral solution of the nitrate. When this precipitation is repeated, it affords a complete separation from cerium, lanthanum, and didymium. This method gives as good results for thorium in monazite as the combination or fumaric acid methods; it is much shorter and offers no difficulties in precipitation or filtration; moreover, with this precipitant, the use of alcohol is avoided. A. McK.

Thorium, Carolinium, Berzelium. CHARLES BASKERVILLE (*J. Amer. Chem. Soc.*, 1904, **26**, 922—941. Compare Abstr., 1902, ii, 85).—Attempts to fractionate thorium compounds with phenylhydrazine according to Jefferson's method (Abstr., 1902, ii, 534) having proved unsatisfactory, pure thorium oxide was heated with sugar carbon in quartz tubes in a current of chlorine. A white vapour first distilled which was partly condensed in the cooler portion of the tube and partly absorbed by alcohol; by dissolving this chloride in water, digesting the resulting oxide with hydrofluoric, hydrochloric, and nitric acids, subsequently dissolving in hot sulphuric acid (1 : 1), precipitating with ammonia, and igniting, a slightly green *oxide* was obtained having a sp. gr. 8·47 and belonging to an element, *berzelium*, with an atomic weight 212. This oxide was only very slightly radioactive. The thorium chloride, which subsequently sublimed in crystals, after purification similar to that described above, gave the values 220·1—220·6 for the atomic weight of thorium, very much lower than that usually accepted for the metal. The non-volatile residual chloride remaining after the removal of thorium and berzelium gave an *oxide* which was soluble in concentrated hydrochloric acid; the *chloride* so formed crystallised from the acid, and belonged to a metal, *carolinium*, with an atomic weight of 255·6. Carolinium oxide has a sp. gr. 11·26, that of thorium oxide being 10·53.

The ultra-violet spectra of the new substances, when examined by Sir William Crookes between λ3444 and 4071·9, showed prominent lines identical with those of thorium. W. A. D.

Further Experiments with Vanadium Steels. Léon Guillet (*Compt. rend.*, 1904, **139**, 407—409. Compare this vol., ii, 266).—Vanadium steels are sensitive to thermal treatment, and annealing brings about considerable changes in the mechanical properties. After being heated at 900° and slowly cooled, vanadium steels exhibiting perlite structure are not more fragile than ordinary steels containing the same amount of carbon. Steels containing a large proportion of vanadium, in which all the carbon is present in the form of carbide are quite heterogeneous. H. M. D.

Platinum Oxides. Lothar Wöhler [and, in part, with A. von Dieterich and F. Strube] (*Zeit. anorg. Chem.*, 1904, **40**, 423—464. Compare this vol., ii, 44).—Only two oxides of platinum exist, namely, the peroxide, PtO_2, which forms several hydroxides, exhibiting different colours, and the suboxide, PtO, which also forms hydroxides. Since the platinum hydroxides readily form colloidal solutions, are very slightly basic, and, on precipitation, retain foreign substances, the various other oxidation products of platinum, previously described by other authors, are supposed not to exist. The analytical methods previously employed are also not free from objection.

In the author's experiments, the analyses of the oxides were conducted by estimating the oxygen volumetrically; the oxide is heated to redness in a current of carbon dioxide, the gases being collected over potassium hydroxide and measured. The water was determined by heating the oxide in a current of dry air and passing the products through a weighed calcium chloride tube. The hydroxides retain water in a remarkable manner, for example, the platinous hydroxide still retains 8·4 per cent. of its water when heated for 14 days at 300°, an amount which diminishes to 6·6 per cent. when the heating is continued for 16 days longer at 405°, the theoretical amount of water in $Pt(OH)_2$ being 7·9. The behaviour of platinic hydroxide is similar. The partially-dehydrated hydroxides exhibit a much smaller solubility in dilute mineral acids than do the freshly-precipitated hydroxides. Platinic oxide, being more acidic than basic, is termed "platinic acid." Its salts undergo considerable hydrolytic dissociation. Platinous oxide is fully acidic.

Platinic hydroxide is prepared as follows: platinic chloride is boiled with an excess of 2*N*-sodium hydroxide, the solution cooled, and then neutralised with acetic acid, when the hydroxide, $H_2Pt(OH)_6$, is precipitated as a yellow powder. When the latter is heated, it turns brown and then black. When the precipitated hydroxide is boiled for a long time, it is converted into the compound $PtO_2,3H_2O$, which, when left over sulphuric acid in a desiccator, is converted into the compound $PtO_2,2H_2O$. The latter hydroxide, when heated at 100°, becomes dark coloured, with the formation of the compound PtO_2,H_2O, which parts with its water with great difficulty. The monohydrate is insoluble in aqua regia and in hydrochloric acid. The platinum tetroxide, described by Jörgensen, does not exist. Illustrations are given of the oxidising action of the dioxide. Platinic hydroxide undergoes appreciable decomposition into platinous oxide when heated at 300° in a current of carbon dioxide. Anhydrous platinous oxide is probably stable in the presence of oxygen at 510°.

When potassium platinous chloride is boiled with the calculated amount of aqueous sodium hydroxide solution, a dark precipitate of platinous hydroxide is formed. It cannot be completely dehydrated. Platinous oxide appears to be a stronger oxidising agent than the dioxide, and a better reducing agent than platinum itself.

A. McK.

Ruthenium. VI. The Bromides. James L. Howe (*J. Amer. Chem. Soc.*, 1904, **26**, 942—946).—*Potassium ruthenobromide*, K_2RuBr_5, obtained by adding potassium bromide to a solution of ruthenium tetroxide in hydrobromic acid and evaporating over sulphuric acid, forms small, brown crystals and is decomposed by water; as the same salt is obtained by adding potassium chloride to a concentrated solution of ruthenobromous acid, the latter probably exists in solution as H_2RuBr_5 and not as $RuBr_3,2HBr$. *Rubidium ruthenobromide*, Rb_2RuBr_5,H_2O, obtained in the same way by using rubidium bromide, crystallises from dilute hydrobromic acid. *Cæsium ruthenobromide*, Cs_2RuBr_5,H_2O, forms slender, black needles.

Potassium aquoruthenibromide, $K_2Ru(H_2O)Br_5$, prepared by boiling potassium ruthenobromide with alcohol and hydrobromic acid and evaporating the solution, separates in minute, brown crystals. The analogous *rubidium aquoruthenibromide* forms a brownish-black, crystalline mass.

Potassium ruthenibromide, K_2RuBr_6, obtained by passing bromine vapour through a concentrated solution of the aquoruthenibromide at 0°, crystallises in minute, black octahedra. *Rubidium ruthenibromide* is similar, but less soluble.

W. A. D.

Preparation and Properties of Ruthenium Silicide. Henri Moissan and Wilhelm Manchot (*Ann. Chim. Phys.*, 1904, [viii], 2, 285—288).—A *résumé* of work already published (compare Abstr., 1903, ii, 604).

M. A. W.

Mineralogical Chemistry.

Ratio of Radium to Uranium in Some Minerals. Bertram B. Boltwood (*Amer. J. Sci.*, 1904, [iv], 18, 97—103).—Various uranium minerals (uraninite, gummite, uranophane, samarskite, and carnotite) were heated with acid, and the radium emanation transferred to a specially constructed, air-tight, gold-leaf electroscope, the rate of discharge of which was taken to indicate the proportion of radium in the mineral. It was found that the amount of radium in each mineral is directly proportional to the amount of uranium. This affords experimental evidence in favour of the suggestion that radium is formed by the breaking down of the uranium atom. L. J. S.

An Occurrence of Native Iron. Jakob Beckenkamp (*Sitz.-Ber. Physikal.-med. Ges. Würzburg*, 1904, 59—65).—A spring-boring at Dettelbach, near Würzburg, after passing through three metres of solid rock, entered beds of grey and red clay of Keuper age; in the latter was found metallic iron as minute particles and pieces up to 30 grams in weight. The iron is of two kinds, with the characters of cast iron and wrought iron respectively. Darker-coloured fragments have sp. gr. 7·0—7·1, and Fe 95, C 5 per cent.; the lighter-coloured have sp. gr. 7·6—7·8, and Fe 99·8, C 0·02. Some of the fragments have a thin, yellow coating, which has the appearance and composition of brass. The characters of this metallic iron are not those of meteoric iron, and it is possible that it is of artificial origin, and may have been thrown into the spring to improve the water. L. J. S.

Analyses of Lorandite and Claudetite. Josef Loczka (*Zeit. Kryst. Min*, 1904, 39, 520—525).—A new analysis of lorandite from Macedonia (Abstr., 1896, ii, 30; this vol., ii, 416) gave: Tl, 59·76; As, 22·30; S, 18·99 per cent. Formula, $TlAsS_2$. Sp. gr. 5·53.

An analysis of claudetite, the monoclinic modification of arsenic trioxide, from Szomolnok, Hungary, gave: As, 75·99 (calc. for As_2O_3, 75·78); insoluble residue, 0·17. L. J. S.

Axial Ratios and Chemical Composition of Ilmenite. G. Doby and G. Melczer (*Zeit. Kryst. Min.*, 1904, 39, 526—540).—Crystallographic descriptions are given of ilmenite from various localities, and the following analyses were made of the crystals which were measured. The results for the material from Prägraten are quoted from Sustschinsky (Abstr., 1903, ii, 84).

Locality.	Axial ratio, *a* : *c*.	Sp. gr.	TiO_2.	FeO.	Fe_2O_3.	CaO.	MgO.	Total.
Snarum…………	1 : 1·368	5·041	5·66	0·11	93·50	—	1·10	100·37 *
Tvedestrand……	1 : 1·3716	4·910	21·58	8·04	70·39	—	—	100·01
Ilmen Mtns. …	1 : 1·3772	4·852	47·68	19·70	33·90	—	0·35	101·63
Kragerö…………	1 : 1·379	4·614	49·68	15·72	34·51	0·07	—	99·98
Prägraten………	1 : 1·3844	—	57·23	40·31		1·15	1·22	100·76 †

* Also trace Mn_3O_4. † Including: Al_2O_3, 0·74; Mn_3O_4, 0·11.

These results show that with increase in titanic acid the vertical (c) axis becomes longer and the specific gravity less. L. J. S.

Minerals [allied to Pyrochlore and Euxenite] from Batum, Caucasus. G. P. Tschernik (*Zeit. Kryst. Min.*, 1904, 39, 624—625; from *Ann. Géol. Min. Russ.*, 1902, 5, 196—203).—Embedded in the felspar of a granite boulder from the bed of the Tschoroch river in the province of Batum were reddish-brown, octahedral crystals of a mineral with the characters of pyrochlore; its composition is given under I. In the same boulder was a vein of a black mineral with the composition given under II; this mineral has a certain resemblance to euxenite, although it is distinct from this.

	Cb_2O_5.	Ta_2O_5.	ThO_2.	TiO_2.	SiO_2.	Ce_2O_3.	La_2O_3.	Di_2O_3.	$Y_2O_3+Er_2O_3$.	UO_2.
I.	26·22	27·39	trace	4·20	—	12·34	0·71	0·63	—	8·33
II.	22·20	—	trace	33·31	7·03	8·53	0·55	0·48	11·20	11·11

	Fe_2O_3.	FeO.	CaO.	MnO.	MgO.	Na_2O.	H_2O.	F.	Total.	Sp. gr.
I.	0·26	6·32	6·00	trace	trace	3·15	1·45	1·90	98·90	4·21
II.	3·24	—	0·44	—	—	—	0·93	—	99·02	4·975

L. J. S.

Fergusonite from the Caucasus. G. P. Tschernik (*Zeit. Kryst. Min.*, 1904, 39, 625; from *Ann. Géol. Min. Russ.*, 1902, 5, 221).—Embedded in the quartz of a fragment of granite from the bed of the Terek river were small, black crystals, which appeared to have the form of a tetragonal pyramid; the following analysis proves the mineral to be fergusonite, which has not previously been recorded from Russia.

$Cb_2O_5+Ta_2O_5$.	$Y_2O_3+Er_2O_3$.	Ce_2O_3.	La_2O_3.	Di_2O_3.	ZrO_2.	FeO.	UO_2.	WO_3.
42·71	36·52	3·65	0·25	0·20	1·06	1·22	6·33	0·69

SnO_2.	CaO.	MnO.	H_2O.	Loss on ignition.	Total.	Sp. gr.
0·12	2·34	0·52	3·09	0·32	99·02	5·657

L. J. S.

Muscovite from Kossoj-Brod, Urals. L. Iwanoff (*Zeit. Kryst. Min.*, 1904, 39, 623; from *Bull. Soc. Imp. Natur. Moscou*, 1902, 16, 507—510).—A "refractory clay" from Kossoj-Brod, in the Syssert district, consists of quartz sand and scales of muscovite. The muscovite has the following composition (mean of five analyses):

SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	CaO.	MgO.	K_2O+Na_2O.	H_2O.	Total.	Sp. gr.
49·73	29·67	4·03	0·67	0·27	0·60	9·31	5·35	99·63	2·813

L. J. S.

Sodalite from Kishengarh, India. Ernest W. Vredenburg (*Records Geol. Survey, India*, 1904, 31, 43—44).—Masses of sodalite, up to a foot across, occur in veins of elæolite-pegmatite in the neighbourhood of Kishengarh, in Rajputana. It is of a bright blue colour, or colourless and transparent. When kept in the dark for a few weeks, the colourless variety assumes a pink colour, which rapidly disappears again on exposure to light. Analysis of the blue sodalite gave :

SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.	Na_2O.	SO_3.	Cl.	Loss on ignition.	Total, less O for Cl.	Sp. gr.
38·055	31·30	trace	0·001	24·77	trace	7·18	0·82	100·508	2·27

L. J. S.

A Mineral allied to Montmorillonite from New South Wales. Charles Anderson (*Records Australian Museum*, 1903, 5, 67—68).—The mineral is amorphous, clay-like, and white with a tinge of pink ; when first found, it was gelatinous. Over sulphuric acid, there is a loss of 10·74 per cent. of water, and at 100° a further loss of 1·16 per cent., which is reabsorbed when the mineral is exposed to moist air. Including this amount of water in the following analysis, the formula is $Al_2O_3,4SiO_2,6H_2O$.

SiO_2.	Al_2O_3.	Fe_2O_3.	MgO.	CaO.	Alkalis.	H_2O at 100°.	$H_2O > 100°$.	Total.
52·72	21·28	0·87	trace	1·44	traces	11·90	12·54	100·75

L. J. S.

Sapphirine-bearing Rock from India. C. S. Middlemiss (*Records Geol. Survey, India*, 1904, 31, 38—42).—A medium-grained rock, composed of hypersthene, sapphirine, biotite, and hercynite, occurs as a thin band associated with pyroxene-granulite and norite in the schists of the Vizagapatam district. The dark bluish-grey sapphirine has the same characters as the Greenland mineral ; there is, however, a good cleavage in one direction. Sp. gr. 3·539. Analysis by T. R. Blyth gave (after deducting about 10 per cent. of hercynite) the following results, agreeing with the formula $MgO,2FeO,6Al_2O_3,2SiO_2$:

SiO_2.	Al_2O_3.	FeO.	MgO.	CaO.	H_2O at 100°.	Loss on ignition.	Total.
12·55	67·06	16·21	3·97	0·17	0·25	0·54	100·75

L. J. S.

Connection between the Optical Characters and the Chemical Composition of Vesuvianite. Carl Klein (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 653—658).—Between the optically positive and negative varieties of vesuvianite there is a series in which there are abnormal arrangements in the coloured rings of the optic figures ; and, as with apophyllite, the optically positive and abnormal varieties pass into the optically negative when the crystals are strongly heated. In apophyllite, this change is due to loss of water and fluorine ; this is also probably the case with vesuvianite, in which the different optical varieties appear to have no connection with the presence of boron or the relative amounts of ferric and ferrous oxides. The mean of 83 analyses of vesuvianite is given below. The optically negative variety contains about 2·6 per cent. of water and fluorine, and this increases in amount, through the abnormal varieties, to about 3 per cent. in the optically positive.

SiO_2.	$Al_2O_3+Fe_2O_3$.	CaO.	MgO + FeO.	Alkalis.	H_2O + F.	Total.
37·75	20·0	35·5	3·0	1·0	2·75	100·0

L. J. S.

Chemical Nature of Cimolite. W. SMIRNOFF (*Zeit. Kryst. Min.*, 1904, **39**, 625—626; from *Trav. Soc. Imp. Natur. St. Pêtersbourg*, 1902, **33**, 214—223, 226—227).—The following analysis of cimolite, from Argentiera, Grecian Archipelago, agrees with the formula $(Ca,Mg)SiO_3,7Al_2Si_3O_9,11H_2O$. Analyses are also given of the portions soluble in hydrochloric acid and in sodium hydroxide solution. It is concluded that cimolite is not a definite chemical compound, but a kaolin-like product of weathering.

SiO_2.	Al_2O_3.	Fe_2O_3.	CaO.	MgO.	H_2O.	Total.
56·27	28·36	1·74	2·63	1·87	8·32	99·19

L. J. S.

A Bole-like Mineral from the Southern Urals. N. SURGUNOFF (*Zeit. Kryst. Min.*, 1904, **39**, 623; from *Bull. Soc. Imp. Natur. Moscou*, 1902, **16**, 511—513).—In cavities of the brown iron ore of the Verchne-Bulansk mine there is frequently found a reddish-brown, clayey substance in compact masses with a waxy fracture. The following analysis shows that the mineral in question is allied to bole or chloropal.

SiO_2.	Fe_2O_3.	Al_2O_3.	CaO.	MgO.	Na_2O.	H_2O.	Total.
39·74	25·06	14·12	0·95	0·58	2·88	16·87	100·20

L. J. S.

Monazite from New South Wales. CHARLES ANDERSON (*Records Australian Museum*, 1904, **5**, 258—262).—Monazite has been previously recorded from two localities in New South Wales, but it has not hitherto been found *in situ*. The occurrence now described is of small crystals and grains of monazite embedded in the quartz and decomposed felspar of a pegmatite-vein in granite, at Blatherarm Creek, near Deepwater. Analysis gave:

P_2O_5.	Ce_2O_3.	$(La,Di)_2O_3$.	$(Y,Er)_2O_3$.	ThO_2.	SiO_2.	$(Al,Fe)_2O_3$.	H_2O.	Total.	Sp. gr.
28·20	35·70	30·73	trace	1·63	0·49	2·23	0·34	99·32	5·119

L. J. S.

Analyses of Rocks. FRANK W. CLARKE (*Bull. U.S. Geol. Survey*, 1904, **228**, 1—375).—This is a new edition of Bulletin No. 168 (1900) (Abstr., 1901, ii, 66), and gives a collection of 1672 analyses of crystalline and sedimentary rocks (including meteorites, clays, soils, &c.) made in the laboratory of the United States Geological Survey during the years 1880—1903. The means of all the determinations made in these analyses are:

SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MgO.	CaO.	Na_2O.	K_2O.	H_2O at 100°.	$H_2O>100°$.
60·91	15·28	2·63	3·46	4·13	4·88	3·45	2·98	0·41	1·49

TiO_2.	ZrO_2.	CO_2.	P_2O_5.	S.	Cl.	F.	BaO.	SrO.
0·73	0·03	0·53	0·26	0·11	0·07	0·02	0·11	0·04

MnO.	NiO.	Cr_2O_3.	V_2O_3.	Li_2O.	Total.
0·10	0·03	0·05	0·03	0·01	101·74

L. J. S.

Weathering of the Ore-bearing Rock of Mount Magnitnaia. JÓZEF MOROZEWICZ (*Zeit. Kryst. Min.*, 1904, **39**, 612—613; from *Verh. russ. min. Ges.*, 1903, **40**, 62—69. Compare this vol., ii, 51).—The rock examined is an augite-diorite. When fresh (anal. II), it consists of plagioclase, yellowish-green augite, magnetite, a little orthoclase, &c. The augite constitutes 34 per cent. of the rock, and has the composition given under I, corresponding with the formula $3CaMgSi_2O_6,\frac{1}{2}CaFe''Si_2O_6,\frac{5}{9}MgAl_2SiO_6,\frac{5}{9}Na_2Fe_2'''SiO_6$. Analyses III and IV are of the rock in different stages of weathering; III is of a compact, ashen-grey mass, and IV of a cavernous, yellowish-grey, kaolin-like mass. Microscopical and chemical study shows that the following is the order of the weathering processes: (1) bleaching of the rock, the iron oxides being dissolved out and in part redeposited in the crevices of the rock; (2) the chloritisation of the augite and the formation of garnet microlites; (3) the kaolinisation of the felspar.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	Mn_2O_3.	CaO.	MgO.	K_2O.	Na_2O.	H_2O.	Total.	Sp. gr.
I.	47·14	0·06	5·24	7·26	6·30	0·80	16·01	13·20	0·55	2·67	0·95	100·18	3·200
II.	46·97	0·14	16·16	10·66	4·38	0·75	9·02	4·56	1·26	4·47	1·74	100·40	2·988
III.	50·42	0·07	16·72	4·32	2·70	0·68	13·36	3·77	1·52	4·24	2·24	100·04	2·918
IV.	47·22	trace	20·09	5·51	2·02	0·66	6·93	4·39	1·52	2·56	8·78	99·78	2·604

L. J. S.

Dioritic Rock from Lower Austria. JÓZEF MOROZEWICZ (*Zeit. Kryst. Min.*, 1904, **39**, 610; from *Verh. russ. min. Ges.*, 1903, **40**, 113—128).—A peculiar rock from the Kremsthal, in Waldviertel, was described by F. Becke in 1882 as an anorthite-diorite-schist. It consists of white bytownite ($59\frac{1}{2}$ per cent.; analyses I and II); pale green hornblende (32 per cent.; anal. III); a pyroxene (?) (7 per cent.; anal. IV) of very remarkable composition; limonite ($\frac{1}{2}$ per cent.), &c. The bulk analysis of the rock is given under V.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	K_2O.	Na_2O.	H_2O.	S.	Total.	Sp. gr.
I.	49·55	—	32·36	0·13	—	—	15·33	—	3·25		0·25	—	100·88	2·722
II.	49·32	—	32·47	0·13	—	—	15·20	—	0·16	2·93	0·25	—	100·46	2·728
III.	43·71	0·31	14·98	2·30	10·72	0·30	11·46	11·70	0·65	2·13	1·48	—	99·74	3·171
IV.	47·72	trace	28·27	—	0·72	—	16·88	0·50	—	2·10	3·78	—	99·97	—
V.	46·72	trace	26·33	1·34	3·52	trace	14·00	3·83	0·51	3·04	1·02	0·11	100·42	2·884

L. J. S.

The Persimmon Creek Meteorite. Wirt Tassin (*Proc. U.S. National Museum*, 1904, 27, 955—959).—This meteorite, weighing 5·014 kilos., was found in 1893 on Persimmon Creek, Cherokee Co., North Carolina. It may be classed as a granular octahedrite containing numerous troilite and some silicate areas. On treating with dilute hydrochloric acid ($1HCl : 25H_2O$), the hydrogen sulphide evolved corresponded with 22·5 per cent. of sulphur; analysis of the soluble portion gave I. The insoluble residue included schreibersite (anal. II; sp. gr. 7·17), tænite (III; formula, Fe_6Ni), olivine (IV; sp. gr. 3·39), and carbon.

	Fe.	Ni.	Co.	Cu.	Mn.	P.	SiO_2.	MgO.	FeO.	Al_2O_3.	Pt.	Total.
I.	94·36	3·72	0·25	0·29	0·01	0·27	0·81	trace	—	trace	trace	99·71
II.	69·33	17·26		—	—	12·50	—	—	—	—	—	99·09
III.	85·00	14·50		—	—	1·00	—	—	—	—	—	100·50
IV.	—	—		—	—	—	39·10	48·20	12·30	—	—	99·60

L. J. S.

Meteorite of Bjurböle. Wilhelm Ramsay and Leon H. Borgström (*Bull. Comm. Géol. Finlande*, 1902, No. 12, 1—28).—This meteorite fell on March 12, 1899, breaking through the ice on the Finnish coast at Bjurböle, near Borgå. Several fragments were collected, the largest weighing 80·2 kilos.; the total weight was estimated at 400 kilos. It is a chondritic stone, containing nickel-iron (7·14 per cent.), troilite, schreibersite, chromite, enstatite (and bronzite), anorthite, olivine, maskelynite (?), and glass. A detailed description is given of the microscopical structure of the chondrules. The following is the composition of the stone:

Fe.	Ni.	Co.	P.	FeS.	SiO_2.	Al_2O_3.	Cr_2O_3.	FeO.	NiO.
6·38	0·72	0·04	0·14	5·44	41·06	2·55	0·59	13·80	0·07

MnO.	CaO.	MgO.	K_2O.	Na_2O.	Total.
0·12	1·82	25·75	0·32	1·24	100·04

L. J. S.

The Narraburra Meteorite. Archibald Liversidge (*J. and Proc. Roy. Soc. New South Wales*, 1904, 37, 234—242, with 12 plates).—This iron, found in 1885 on Narraburra Creek, Temora, New South Wales, weighed 70 lb. 14 oz., and had sp. gr. 7·57. Widmanstätten figures are prominently developed, and eight parallel sections were cut to show the structure of the mass in different parts. Analysis gave:

Fe.	Ni.	Co.	Cu.	P.	S.	C.	Resinous matter.	Insol. in HCl.	Pt, Au.	Total.
88·605	9·741	0·474	0·009	0·429	trace	not det.	0·008	0·720	traces?	99·986

L. J. S.

Chemical and Geological Studies of Different Springs in the North of Madagascar. Georges Lemoine and Paul Lemoine (*Compt. rend.*, 1904, 139, 248—254).—The paper contains descriptions and analyses of eight thermal mineral waters collected in two different regions in the North of Madagascar, and also of three samples of normal water from the same districts; the mineral waters are characterised by the large proportion of sodium hydrogen carbonate they contain, varying from 0·12 to 1·58 grams per litre, and due to the amount of sodium salts in the volcanic rocks of the district (compare Lacroix, *Compt. rend.*, 1901, 132, 439). M. A. W.

Physiological Chemistry.

Heteromorphism of Horse's Hæmoglobin. M. Uhlik (*Pflüger's Archiv*, 1904, 104, 64—88).—In addition to the ordinary rhombic crystals, true hexagons are also obtainable of horse's hæmoglobin. The methods by which this can be accomplished are described fully, and the crystals figured. Venosity of the blood and a low temperature appear to be the principal factors operating in the production of hexagons. The meaning of such heteromorphism is discussed, but not settled. W. D. H.

Effect of Intravenous Injection of Formaldehyde and Calcium Chloride on the Hæmolytic Power of Serum. C. C. Guthrie (*Amer. J. Physiol.*, 1904, 12, 139—148).—The intravenous injection of formaldehyde and of calcium chloride attenuates the hæmolytic action of serum, although not so markedly as in experiments *in vitro*. W. D. H.

The Gastric Juice of New-born Dogs. W. Gmelin (*Pflüger's Archiv*, 1904, 103, 618—626).—Cohnheim and Soetbeer (*Zeit. physiol. Chem.*, 37, 467) state that new-born dogs secrete what Pawloff calls "psychical" gastric juice. In the present research, Pawloff's operation was found to be too complex for such small animals, and a simpler one was used. The juice does not contain hydrochloric acid until about the 21st day of life, although lactic acid was occasionally noted. Reflex secretion does not occur before the 18th day. After that date, flesh diet stimulates the secretion of more acid than milk does. During the first few days of life, milk is mainly digested in the intestine, where also Weinland's antiferments were found. W. D. H.

The Chemical Combination and Action of Absorbed Phosphorus in the Body. Václav Plavec (*Pflüger's Archiv*, 1904, 104, 1—63).—Absorbed phosphorus does not act in the free form, for the breathing of compressed oxygen or of ozone has no influence on the course of the poisoning. After absorption, phosphorus, given in the free state, is combined as an oxide or as a compound in the protoplasm. In the blood, the higher the body temperature and the more oxyhæmoglobin it contains, the greater and more rapid is the union of phosphorus. W. D. H.

Can the Small Intestine absorb Calcium Stearate? E. A. Knauer (*Pflüger's Archiv*, 1904, **104**, 89—108).—The experiments recorded on dogs and rabbits yield no confirmation of the statement that the small intestine can absorb calcium soaps. W. D. H.

The Action of Certain Antiseptics on Pepsin. Jul. A. Grober (*Pflüger's Archiv*, 1904, **104**, 109—118).—Toluene and chloroform have a harmful influence on enzymes, of which pepsin was particularly investigated. W. D. H.

Effect of Inanition on the Brain of the Rat. Shinkishi Hatai (*Amer. J. Physiol.*, 1904, **12**, 116—127).—Partial starvation in the white rat stops the growth of the brain, and causes in full-grown animals an appreciable loss of brain substance. The percentage of water and of ether-alcohol extracts is affected to a very slight degree.

W. D. H.

Reducing Action of the Animal Organism under the Influence of Cold. Christian A. Herter (*Amer. J. Physiol.*, 1904, **12**, 128—138).—A considerable fall in body temperature is attended by a diminished reduction of methylene-blue to leuco-methylene-blue, and this result is specially striking in the case of the muscles, including the heart and diaphragm and the grey matter of the central nervous system. Experiments on the effect of febrile temperatures are in contemplation. W. D. H.

Structural Changes of Ova in Anisotonic Solutions and Saponin. Torald Sollmann (*Amer. J. Physiol.*, 1904, **12**, 99—115).—Anisotonic solutions cause decomposition and solution of the cytoplasm of ova, raising the osmotic pressure to such a degree that the cell may swell in hypertonic solutions. The behaviour of the erythrocytes of annelids towards laking agents closely resembles that of vertebrate corpuscles. W. D. H.

Elimination of Endogenous Uric Acid. Elbert W. Rockwood (*Amer. J. Physiol.*, 1904, **12**, 38—54).—Burian, Schur, Walker Hall, and others maintain that the endogenous purine output is variable for different individuals, but constant in quantity for the same person. This contention is supported by the present experiments. The individual constancy is striking when various diets are given in the same person, and when the same diet is given to different persons.

W. D. H.

Effect of Alcohol on the Excretion of Uric Acid in Man. S. P. Beebe (*Amer. J. Physiol.*, 1904, **12**, 13—37).—The experiments were conducted on men unaccustomed to the use of alcohol in any form. Moderate doses of various alcoholic liquids (ale, wine, &c.) were given. After some degree of immunity had been established, evidence of its proteid sparing effect was obtained; it may thus in a sense be regarded as a food. But this is counterbalanced by its harmful effect on the liver; the oxidation processes in this organ are lessened, and an increase of uric acid excretion is the immediate result. W. D. H.

Intermediary Purine Metabolism; the Production of Allantoin. LAFAYETTE B. MENDEL and BENJAMIN WHITE (*Amer. J. Physiol.*, 1904, 12, 85—94).—The intravenous injection of urates in cat and dog, like that of nucleic acid, causes an excretion of allantoin. This is most marked when the injection is made into the portal vein. Observations on rabbits gave negative results. The result in carnivora is interfered with by sulphonal. Allantoin is probably formed in the liver. W. D. H.

Fate of Glycine in the Dog's System when injected Intravenously. SERGEI SALASKIN and KATHARINA KOWALEWSKY (*Zeit. physiol. Chem.*, 1904, 42, 410—414. Compare Stolte, *Hofmeister's Beitr.*, 5, 15; also Abstr., 1898, ii, 441).—A single injection of a considerable amount of glycine increases the amount of ammonia in the blood, the glycine is rapidly removed from the blood, a small amount is eliminated with the urine, and part is given up to the other tissues. Glycine is not found as such in the tissues, as it rapidly undergoes decomposition, yielding carbamide probably by the elimination of ammonium carbonate or carbamate. J. J. S.

Behaviour of Aspartic Acid in the Animal Organism. ERNST SALKOWSKI (*Zeit. physiol. Chem.*, 1904, 42, 207—212).—It is shown that aspartic acid administered to dogs is eliminated in the urine as carbamide and not as uraminosuccinic acid. Possibly a small amount is eliminated undecomposed. J. J. S.

Occurrence of Amino-acids in Urine, especially in Cases of Gout. ALEXANDER IGNATOWSKI (*Zeit. physiol. Chem.*, 1904, 42, 371—400).—Normal human urine contains only traces of amino-acids; even after subcutaneous injection of 6 grams of glycine, amino-acids cannot be detected in this liquid. Considerable amounts are sometimes found, however, (*a*) in cases of gout—in seven instances glycine was found and in three cases other amino-acids, probably leucine and aspartic acid; (*b*) in cases of pneumonia.

The method of detection was a modified form of that described by E. Fischer and Bergell (Abstr., 1903, i, 24. Compare Abderhalden and Bergell, *ibid.*, ii, 742). The urine is precipitated with lead acetate, the lead removed from the filtrate by means of hydrogen sulphide, the liquid evaporated at a temperature below 45° to half its bulk and then extracted for 3 hours with ether. The purified urine is then shaken for 9 hours with an ethereal solution of naphthalene-β-sulphonic chloride, care being taken to keep the solution faintly alkaline by means of potassium hydroxide. The addition of hydrochloric acid to the aqueous solution precipitates the naphthalene-β-sulphonyl derivatives of the amino-acids. J. J. S.

The Combined Action of Proteolytic Enzymes. PHOEBUS A. LEVENE and L. B. STOOKEY (*Amer. J. Physiol.*, 1904, 12, 1—12).—When spleen and pancreas (mixed glands or extracts) act on egg albumin or casein, the amount of digestion products is greater than the sum of the products when the two glands act separately. This is chiefly attributable to increase in the activity of the pancreatic enzyme, for if all the zymogen of the pancreas is converted into enzyme previously, the effect mentioned in the first paragraph is no longer noticeable. These experiments corroborate Schiff's view that the spleen facilitates the transformation of the pancreatic zymogen into the active enzyme. No similar action of the spleen on the liver was detected.

W. D. H.

Combustion of Carbohydrates. II. The Active Substance of the Pancreas. OTTO COHNHEIM (*Zeit. physiol. Chem.*, 1904, **42**, 401—409. Compare Abstr., 1903, ii, 738).—To obtain the active principle of pancreas previously described, the following method is recommended. The pancreas is chopped up, thrown into boiling water, and evaporated to dryness. The residue is extracted several times with alcohol and the extracts evaporated to dryness. This residue is extracted with hot ether and the insoluble part dissolved in alcohol, filtered, evaporated, and again dissolved in alcohol. When required for use, the solution is evaporated and the residue dissolved in water, so that 10 c.c. of the solution = 1 gram pancreas. The substance closely resembles the product obtained by Magnus (this vol., ii, 628) from liver.

It is found that the addition of too large a quantity of the pancreas extract tends to retard the combustion of the sugar. The maximum results are obtained when 0·8 gram of pancreas is used with 75 grams of muscle.

Blood serum contains an acceptor similar to pancreas, and muscle from which the blood has not been entirely removed therefore acts in the same manner as muscle and pancreas extract, and the addition of much pancreas extract retards the combustion. J. J. S.

The Influence of the Pancreas on the Composition of Proteid. PETER BERGELL and FERDINAND BLUMENTHAL (*Pflüger's Archiv*, 1904, **103**, 627—631).—Fischer has shown that the pancreatic ferment easily hydrolyses peptides which contain tyrosine and leucine, but that it cannot destroy analogous compounds of alanine or glycine such as the dipeptide glycylglycine, $NH_2{\cdot}CH_2{\cdot}CO{\cdot}NH{\cdot}CH_2{\cdot}CO_2H$.

In a dog without a pancreas, the urine was free from proteid and peptone, but contained tyrosine in abundance: glycylglycine was injected subcutaneously in large quantities; no glycine appeared in the urine, and only traces of glycylglycine. In the normal animal, both are found; the pancreas being absent, the ability to decompose the dipeptide had disappeared. Feeding on tyrosine or substances containing it increases the amount in the urine; in healthy animals, this does not occur. The clinical importance of tyrosine in the urine in cases of pancreatic disease is noted. W. D. H.

Composition of Gorgonian Corals. FRANK C. COOK (*Amer. J. Physiol.*, 1904, **12**, 95—98).—Investigation of the iodine-containing organic material called gorgonin in several kinds of corals shows the amount of sulphur to be less than 2 per cent., which is not so high as in Mediterranean species. Mercaptan was not obtained. Bromine was absent. The large amount of nitrogen and the failure to obtain carbohydrate groups show that gorgonin is not allied to chitin.

W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

Velocity of Fermentation Reactions on the Addition of Chemically Indifferent Substances. HERMANN BRAEUNING (*Zeit. physiol. Chem.*, 1904, 42, 70—80).—It has been found that when part of the water in a process of fermentation is replaced by some chemically indifferent substance which is soluble in water, the velocity of the reaction is diminished. Among the examples given are addition of glycerol to invertase solution, to emulsin, zymase, pepsin, trypsin, or rennet, or even to yeast.

Carbamide has a retarding action on invertase and on yeast, whilst dextrose or lactose produces the same effect on trypsin. Examples are also quoted from other researches.

Two exceptions to the generalisation appear to exist. Weiss (*Zeit. physiol. Chem.*, 1902, 40, 488) states that the pancreatic fermentation of fibrin is not affected by dextrose, and Arnheim (*ibid.*, p. 238) that dextrose, milk sugar, or dextrin accelerates the autolysis of the liver ferment.

The addition of colloidal solutions of indifferent substances such as gum arabic has not always the same effect. J. J. S.

The Mechanism of Respiratory Combustion. Production of Citric Acid by Citromycetes. PIÉRRE MAZÉ and A. PERRIER (*Compt. rend.*, 1904, 139, 311—313).—The formation of citric acid in pure cultures of *Citromycetes* begins when the mould has nearly attained its maximum weight and the medium no longer contains nitrogen in a form capable of being assimilated; the young cells grow at the expense of the older ones, depriving them of their nitrogen and forming citric acid at the same time. *Citromycetes* can assimilate other ternary food-stuffs than sugar, for example mannitol, glycerol, alcohol, or the higher hydroxy-acids of the aliphatic series, citric acid being produced at the expense of these substances; moreover, the production of citric acid takes place equally well in cultures deprived of air; it is probable, therefore, that the formation of this acid is not due to the direct oxidation of sugar, but to the breaking down of the living substance itself. M. A. W.

Variations of Mineral Matters in Ripening Seeds. GUSTAVE ANDRÉ (*Compt. rend.*, 1904, 138, 1712—1714).—The amount of ash in lupin and haricot pods during the ripening period increases up to a certain point and then diminishes. The decrease in the amount of ash is not proportional to the decrease in dry matter.

As regards the seeds, the amount of ash goes on increasing to the end. The percentage amount of ash, however, decreases during the ripening period.

The amounts of calcium and magnesium in the pods increase at the commencement of the ripening period and then diminish. The amount of potassium increases during the whole period, both in the pods and in the seeds. The phosphoric acid of the seeds increases up to the end, whilst in the case of the pods the accumulation which takes place in the first stages of ripening is followed by a loss. N. H. J. M.

Complete Extraction of Water and Gas from Seeds. Paul Becquerel (*Compt. rend.*, 1904, 138, 1721—1723).—The results of experiments with peas indicated that the seed can be completely deprived of water and gas at a temperature of 50° by means of sulphuric acid or baryta in a vacuum.

The difficulty due to the tegument of the seed and to the albumen, which is often mucilaginous and becomes more and more impervious as desiccation proceeds, may be overcome by employing decorticated seeds or by cutting the tegument and albumen. N. H. J. M.

Mechanism of the Action of the Cytoplasm in Germinating Seeds. Maurice Nicloux (*Compt. rend.*, 1904, 139, 143—145. Compare this vol., ii, 508).—The acidity of germinating oleaginous seeds is due to two aliphatic acids derived from the fatty substance of the seed under the influence of the protoplasm, carbon dioxide, and water.

The same reaction may be produced with oils of various origin by means of mechanically-separated cytoplasm and water saturated with carbon dioxide. N. H. J. M.

Plant Acidity. Eugène Charabot and Alexandre Hébert (*Compt. rend.*, 1904, 138, 1714—1716).—The acidity due to volatile acids is always highest in the leaves. In shaded plants, however, the acidity is highest in the roots. The relations between the saturated volatile acids and the total volatile acids increases during the growth of leaves and stems and is greater in the stems than in the leaves.

The alkalinity of the ash is always greatest in the leaf. In absence of light, the amount of combined organic acids increases. Suppression of inflorescence reduces the amount of combined organic acids.

The whole of the results obtained accord with the view that organic acids are probably oxidation products of carbohydrates.

N. H. J. M.

Factors of Availability of Plant Food. George S. Fraps (*Amer. Chem. J.*, 1904, 32, 1—13).—The amounts of available potassium and phosphoric acid in soil are somewhat increased by moisture. Calcium sulphate and carbonate diminish the amount of available potassium, and calcium carbonate reduces the amount of available phosphoric acid as well.

Starch and sawdust decrease the available phosphoric acid, but increase the available potassium. In one case, the amount of available potassium was doubled. Stable manure has a similar effect on the potassium of the soil. N. H. J. M.

Fly Agaric (Amanita Muscaria). Wilhelm Heinisch and Julius Zellner (*Monatsh.*, 1904, 25, 537—544).—This fungus was collected from Upper Styria and from the granite region of Southern Bohemia. The air-dried fungus is 14·9, and the ash 1·02—1·05 per cent. of the fresh material. The following is the composition of the ash; the numbers being percentages, the first for the ash of the Styrian and the second for that of the Bohemian fungus:—

	I.	II.		I.	II.
K	44·00	41·10	PO_4	23·13	20·77
Na	0·24	0·58	SO_4	3·08	2·46
Mg	1·37	1·25	Cl	6·88	6·41
Ca	0·53	0·21	SiO_3 (soluble)	0·88	7·38
Al	2·46	1·26	SiO_2 (insoluble)	5·87	8·33
Fe	0·12	0·06	CO_3,O, loss	11·44	10·19

(With traces of Mn in each.)

On extracting the air-dried substance with light petroleum (b. p. 40—70°), and distilling off the solvent finally at 130° in an atmosphere of carbon dioxide, an oil is obtained, which, at the ordinary temperature, deposits a crystalline substance melting at 42—44° and solidifying completely at 8—9°. It has a sp. gr. 0·9166 at 15°, n_D, 1·460—1·470 at 20°, hydrolysis number 227, acid number 177, iodine number 82, Hehner's number 97·93, Reichert-Meissl's number 4·4. The insoluble fatty acid melts at 10°. The oil contains 7·42 per cent. of lecithin, and also ergosterin (Tanret, Abstr., 1889, 407), glycerol, choline, butyric, palmitic (the only solid acid present), and oleic acids, the last of these acids constituting 90 per cent. of the total fat. G. Y.

Analytical Chemistry.

Use of Hydrazine Sulphate in Gasometric Analysis. J. de Girard and A. de Saporta (*Bull. Soc. chim.*, 1904, [iii], 31, 905—907. Compare Purgotti, Abstr., 1897, ii, 349).—The authors find that when solutions of copper and hydrazine sulphates are mixed, a crystalline precipitate of the double sulphate, $CuSO_4,N_2H_4,H_2SO_4$, is formed, which is not decomposed on addition of sodium chloride, as Purgotti supposed (*loc. cit.*), but is attacked by sodium hydroxide, forming cuprous oxide and liberating nitrogen. Measurement of the nitrogen liberated permits of the estimation of copper, every 2 grams of copper sulphate furnishing about 50 c.c. of the gas. This method may be applied indirectly to the estimation of reducing sugars by dissolving the cuprous oxide formed, when these sugars are boiled with excess of Pasteur's solution, in a mixture of nitric and sulphuric acids and estimating with hydrazine sulphate the amount of copper sulphate produced. The liberation of nitrogen in the cold by the interaction of solutions of hydrazine sulphate and sodium nitrite may similarly be employed for the estimation of the latter salt. T. A. H.

Employment of Persulphate for Quantitative Separations. MAX DITTRICH and C. HASSEL (*Zeit. anal. Chem.*, 1904, 43, 382—387. Compare Abstr., 1902, ii, 693; 1903, ii, 243, 254).—The authors ascribe the failure of v. Knorre to effect the complete separation of manganese from other metals by ammonium persulphate (this vol., ii, 213) to the very large quantities of material employed, and the impossibility of washing completely such large precipitates. They have repeated their experiments, and, working with about 0·1 gram of Mn_3O_4 to which 0·5 gram of a salt of zinc, cadmium, copper, nickel, calcium, or magnesium was added, have obtained results for the manganese which differed by only a few tenths of a milligram from the quantity taken, and where they examined the manganese precipitate for the other metal (for example, copper and cadmium) not a trace could be detected. Even when employing quantities as large as those taken by v. Knorre, they were able by a second precipitation to obtain a complete separation in the case of copper.

M. J. S.

Estimation of Nitric Acid with Ferrous Sulphate. G. BAILHACHE (*Bull. Soc. chim.*, 1904, [iii], 31, 843—846. Compare Debourdeaux, this vol., ii, 147).—The apparatus consists of a 250 c.c. flask closed by an india-rubber bung carrying a stoppered dropping funnel and a small serpentine condenser, to the upper extremity of which is joined a small U-tube of narrow bore ending in a bulb containing a little mercury.

The standard solution contains 110 grams of ferrous sulphate and 75 c.c. of sulphuric acid per litre. With 50 c.c. of this, previously placed in the flask, 30 c.c. of strong sulphuric acid are mixed; 20 c.c. of a saturated solution of sodium hydrogen carbonate are then added slowly through the dropping funnel, the liquid being meanwhile heated to the boiling point. To the hot liquid, 10 c.c. of the nitrate solution (about 5 per cent.) are added through the dropping funnel; the stopper is then closed and the heating continued until no more gas is evolved. The last traces of the nitrate solution are washed through the dropping funnel with a saturated solution of sodium hydrogen carbonate and the unchanged ferrous sulphate is estimated in the usual way with potassium permanganate or dichromate. T. A. H.

Method for the Determination of Chloric Acid. WALTER S. HENDRIXSON (*Amer. Chem. J.*, 1904, 32, 242—246).—Metallic iron readily reduces free chloric acid, even in very dilute solutions. On adding an excess of sulphuric acid and then iron to a solution of chloric acid or a chlorate, reduction proceeds at the ordinary temperature. Ferric sulphate is at first formed, and the end of the reaction is indicated by the disappearance of the yellow colour. The solution is titrated with silver nitrate. The method is also applicable to bromates, but perchlorates are not attacked. C. H. D.

Estimation of Phosphates in Natural Waters. Azariah T. Lincoln and Perry Barker (*J. Amer. Chem. Soc.*, 1904, **26**, 975—980).—The authors have rendered Schreiner's method for estimating minute quantities of phosphates (*J. Amer. Chem. Soc.*, 1901, **23**, 96; 1902, **24**, 735) applicable to waters which contain a larger proportion of silica than phosphoric acid, by adding a small known excess of a standard solution of a phosphate. The procedure then becomes exactly the same as described by Schreiner. W. A. D.

Estimation of Phosphorus or Arsenic in Organic Compounds. C. Monthulé (*Ann. Chim. anal.*, 1904, **9**, 308—309).—A solution is prepared by dissolving magnesium oxide in nitric acid of sp. gr. 1·38, so that 100 c.c. of liquid will contain 10 grams of magnesia. The substance to be tested, if solid, is immersed in the reagent contained in a porcelain dish, and the mass is evaporated to dryness gradually and finally subjected to a red heat. If the carbon does not burn off readily, a second treatment with nitric acid is necessary.

The residue is now dissolved in dilute hydrochloric acid, and the phosphorus or arsenic is then precipitated as magnesium ammonium phosphate or arsenate by adding ammonia. L. de K.

Detection of Arsenic in Normal Animal Tissues by means of the Biological Method. M. Segale (*Zeit. physiol. Chem.*, 1904, **42**, 175—180. Compare Gautier, Abstr., 1900, ii, 670; Hödlmoser, 1901, ii, 673; Cerny, 1902, ii, 274).—Arsenic can readily be detected in practically all animal tissues by the aid of Gosio's method with *Penicillium brevicaule* (Abstr., 1897, ii, 381; 1901, ii, 182, 193), provided that the tissue is first subjected to autolysis in the presence of a few drops of chloroform for 20—60 days at 37°. The only tissues which give negative results are horn, hair, feathers, &c., which do not undergo autolysis under the conditions mentioned.

Tellurium gives a very similar result; the odour is, however, somewhat different and the reaction not nearly so delicate as with arsenic. Selenium gives quite a different odour. J. J. S.

Titration of Ammonium Salts. Ferdinand Jean (*Ann. Chim. anal.*, 1904, **19**, 257).—Ten grams of the sample are put into a 500 c.c. flask, dissolved in 250 c.c. of water, and mixed with about 200 c.c. of a solution of pure sodium hydroxide (38 grams per litre). The whole is then diluted to 500 c.c. and allowed to settle.

Twenty-five c.c. are pipetted off and titrated with $N/2$ oxalic acid, using lacmoid as indicator. Another 25 c.c. are diluted with 30 c.c. of water and boiled in a conical flask for half an hour, 20 c.c. of water are added, and the remaining alkali is again titrated. The difference in the titrations represents the volatile alkali or the ammonia.

L. de K.

Estimation of Calcium. OSWALD BRÜCK (*Zeit. angew. Chem.*, 1904, 17, 953).—A criticism of Kettler's method (this vol., ii, 517) Conversion into calcium sulphate, besides not being novel, is less simple than the time-honoured method of treating the ignited calcium oxalate with ammonium carbonate and weighing as carbonate.

L. DE K.

Rapid Method for the Estimation of Lime in a Cement. BERNARD ENRIGHT (*J. Amer. Chem. Soc.*, 1904, 26, 1003—1006).—0·5 gram of the finely powdered cement, suspended in 100 c.c. of hot water in an evaporating dish, is dissolved by adding 30 c.c. of hydrochloric acid (1 : 1); after adding a few drops of bromine water, the solution is boiled until only a few flakes of silica remain, dilute ammonia is added, the solution again boiled for 1 minute, and filtered. The precipitate is washed back into the dish, 10 c.c. of hydrochloric acid are added, the solution diluted to 100 c.c., and again precipitated with ammonia; the precipitate contains all the ferric oxide and alumina and the greater part of the silica. The two filtrates are mixed, slightly acidified with hydrochloric acid, and precipitated hot with ammonium oxalate; the solution is boiled and hot dilute ammonia added, with constant stirring, until an excess equivalent to about 5 c.c. of concentrated ammonia is present. After boiling for 5 minutes, precipitation will be complete after another 15 minutes. The precipitate is then transferred to a conical flask, dissolved in hot dilute sulphuric acid, and the solution titrated with a potassium permanganate solution which has previously been standardised by means of a standard cement. W. A. D.

Analysis of Portland Cement. BERTRAM BLOUNT (*J. Amer. Chem. Soc.*, 1904, 26, 995—1003).—The "insoluble residue" is best determined by dissolving the cement in hydrochloric acid, evaporating the solution to dryness, redissolving the residue in hydrochloric acid, filtering, washing, extracting the precipitated silica with aqueous sodium carbonate, and collecting the final insoluble residue. A comparison is made of the results of this method with those obtained by Hillebrand's process. The latter gives an insoluble residue which is a cementitious material rather than a true insoluble residue.

It is also shown that a double evaporation in estimating the silica of a cement is unnecessary; that the silica obtained in a cement analysis contains neither ferric oxide nor alumina, and that, under these conditions, the amount of silica carried down in the precipitation of these oxides by ammonia is extremely small. W. A. D.

Colorimetric Estimation of Magnesium. OSWALD SCHREINER and W. S. FERRIS (*J. Amer. Chem. Soc.*, 1904, 26, 961—967).—In this method, which gives good results in the estimation of minute quantities, the magnesium is precipitated by means of potassium hydrogen phosphate after adding a few drops of ammonium oxalate to prevent the co-precipitation of calcium salts present; the precipitate, after being thoroughly washed, is dissolved in nitric acid, and, ammonium molybdate having been added, the solution is compared colorimetrically with magnesium solutions of known concentration.

In order to obtain successful results, the details given by the author have to be followed closely. W. A. D.

Detection of Cadmium in Silver Ornaments. LOUIS L'HÓTE (*Ann. Chim. anal.*, 1904, 9, 241—242).—Cadmium is frequently substituted to some extent for copper in silver alloys. This may be readily detected by heating the metal in a cupel or in a combustion tube after addition of some lead, or simply by heating the metal over a Bunsen flame and condensing the fumes on the bottom of a tube filled with water.

The brown sublimate so obtained is then tested for cadmium by the usual reagents. L. DE K.

Use of Complex Salts in Electrolytic Analysis: Separation of Copper from Arsenic and Antimony, Nickel from Zinc, and Zinc from Iron. AUGUSTE HOLLARD and L. BERTIAUX (*Bull. Soc. chim.*, 1904, [iii], 31, 900—904).—The deposition of small quantities of arsenic with the copper in the electrolytic estimation of this metal is avoided if the operation be conducted in nitric acid solution to which a small quantity of ferric sulphate has been added, since, under these conditions, the arsenic is maintained in the state of arsenic acid throughout the experiment. Antimony may be eliminated similarly by the addition of lead sulphate to the mixture, the lead peroxide formed on the anode serving to retain this impurity (Hollard, Abstr., 1903, ii, 294).

In addition to the methods already described for the electrolytic separation of zinc and nickel (Abstr., 1903, ii, 335, and this vol., ii, 92), the deposition of the former metal may be prevented by converting it into a zinc-ammonium nitrite, provisionally represented by the formula $Am_2[Zn(NO_2)_2]_2$. To the solution of the sulphates of the two metals, magnesium sulphate (5 grams) and ammonia solution, 22° B. (20 c.c.), are added. The liquid is then made slightly acid with sulphuric acid, and ammonium nitrate (12·5 grams) added, followed by a saturated solution of sulphur dioxide (25 c.c.). The excess of sulphur dioxide is removed by ebullition, the liquid is then somewhat diluted and solution of ammonia, 22° B. (25 c.c.), added, and the whole made up to 300 c.c. A current of 1 ampere is used at 85°; the deposit of nickel is complete in a few hours.

Zinc may be separated from iron by converting the latter into potassium ferrocyanide, as already described (Abstr., 1903, ii, 513). The electrolysis is carried out in the cold with a current of 0·4 ampere. The zinc deposited may contain from 0·039 to 0·103 per cent. of iron.

It is pointed out that the method of separating and estimating antimony described by A. Fischer (Abstr., 1903, ii, 616) had already been published by one of the authors (Hollard, Abstr., 1900, ii, 442, and 1903, ii, 455).

In the cases described above, the metals present in the complex ions are not deposited on the cathode, but with the double cyanides of gold, silver, cadmium, and mercury with potassium the heavy metals are deposited, probably because in these cases the complex ions are themselves further dissociated. T. A. H.

Bismuth Method for the Estimation of Manganese. Andrew A. Blair (*J. Amer. Chem. Soc.*, 1904, 26, 793—801).—The bismuth method for the estimation of manganese, originally proposed by Schneider, is based on the fact that a manganous salt in the presence of an excess of nitric acid is oxidised to permanganic acid by bismuth tetroxide. The permanganic acid formed is very stable in nitric acid of sp. gr. 1·135 when the solution is cold. The excess of bismuth salt is filtered off and an excess of ferrous sulphate added to the filtrate, the amount necessary to deoxidise the permanganic acid being determined by titration with permanganate.

The author finds the method very accurate and rapid and gives details of the estimation of manganese in steel, pig iron, and iron and manganese ores. A. McK.

Estimation of Small Amounts of Ferric Iron by Acetylacetone. H. B. Pulsifer (*J. Amer. Chem. Soc.*, 1904, 26, 967—975).—Acetylacetone may be used in a colorimetric method for estimating traces of iron in nearly all those cases in which potassium thiocyanate has hitherto been employed. It has the advantage that the pink colour it produces with a ferric salt is remarkably permanent and nearly independent of temperature; moreover, very few inorganic salts which can exist in solution with ferric iron have any influence on the colour. The range over which acetylacetone can be used is greater than that of potassium thiocyanate; the smallest quantity of iron that can be detected is 0·000003 gram, and the largest with which the method can be used in a 50 c.c. tube is 0·0006 gram. Standard iron solutions are made by dissolving pure iron wire in a few c.c. of hydrochloric and nitric acids and suitably diluting; the final solution should not contain so much acid that, when placed in a Nessler cylinder, it appears pink by reflected light. The solutions which are compared with the standard solutions should have roughly the same acidity as these. To each 50 c.c. of the very dilute iron solution, 2 c.c. of a 0·5 per cent. solution of acetylacetone is added; this is sufficient, with the concentrations of iron given above, to produce the maximum coloration. W. A. D.

Electrolytic Separation of Nickel and Zinc. Auguste Hollard and L. Bertiaux (*Compt. rend.*, 1904, 138, 1605. Compare Abstr., 1903, ii, 335; this vol., ii, 92).—In addition to the methods already described for the electrolytic separation of nickel and zinc, a third method consists in converting the zinc into a double nitrite of zinc and ammonium which does not yield zinc ions. The nickel and zinc, in the form of their sulphates, are treated successively with magnesium sulphate, ammonia, dilute sulphuric acid, ammonium nitrate, and sulphur dioxide, the excess of sulphur dioxide is boiled off, the liquid rendered alkaline with ammonia and diluted; electrolysis is effected with a current of 1 ampere at a temperature of 85° for several hours. M. A. W.

Action of Nitric and Acetic Acids on Alkali Chromates. Auguste Leube (*Ann. Chim. anal.*, 1904, 9, 303—304).—In the assay of chrome iron ore, it is customary to treat with dilute nitric acid the product of the disintegration with sodium carbonate in order to decompose the salts formed. The author has proved experimentally that under these conditions a very appreciable proportion of the chromic acid is reduced to a chromic salt and ultimately precipitated with the iron oxide on adding ammonia. Further experiments proved that this reduction also takes place to some extent in the cold.

Acetic acid behaves similarly to nitric acid. L. DE K.

Volumetric Estimation of Vanadium and Chromium in the same Solution. EM. CAMPAGNE (*Bull. Soc. chim.*, 1904, [iii], 31, 962—965. Compare Abstr., 1903, ii, 761, and Nicolardot, this vol., ii, 369).—The chromium is converted into sulphate and the vanadium into divanadyl sulphate by the method already described (*loc. cit.*). The vanadium is then titrated with permanganate (*ibid.*), and, finally, excess of permanganate is added and the liquid boiled to convert the chromium sulphate into chromic acid. The excess of permanganate is eliminated by ebullition with portions of filter paper, and to the filtrate a known quantity of ferrous sulphate is added, and the portion unoxidised by the chromic acid is determined by titration with permanganate. In reality, the excess of ferrous salt reduces an equivalent portion of vanadic acid to divanadyl sulphate, and it is this which is titrated. The results are not affected by the presence of small quantities of ferric sulphate in the original liquid. If the quantity of chromium present is large compared with the vanadium, it is necessary to work with small quantities of the material, since the green colour of the chromium salt somewhat obscures the end reaction in the titration of the vanadium. T. A. H.

Electrolytic Estimation of Bismuth. AUGUSTE HOLLARD and L. BERTIAUX (*Compt. rend.*, 1904, 139, 366—367).—To separate bismuth from copper, the bismuth is precipitated as phosphate by addition of phosphoric acid, and to facilitate the removal of any copper salt, the precipitated phosphate is washed with a solution containing ammonium hydrosulphide and potassium cyanide. The bismuth phosphate is then dissolved in dilute nitric acid, evaporated with sulphuric acid, the solution diluted, and electrolysed with a current of 0·1 ampere. Any small quantity of copper deposited with the bismuth is corrected for by a colorimetric determination.

To separate bismuth from lead, the authors precipitate the lead as sulphate, add alcohol, and electrolyse the solution directly without filtering. If the lead sulphate is filtered off, considerable quantities of bismuth are lost, and if alcohol is not added the appreciable solubility of the lead sulphate results in the deposition of lead along with the bismuth. H. M. D.

Microchemical Detection of Gold by means of the Colloidal Coloration of Silk Fibres. JULIUS DONAU (*Monatsh.*, 1904, 25, 545—554. Compare Emich, Abstr., 1902, ii, 45, 351).—When a solution of gold chloride in hydrochloric acid is poured into a vessel which has been rinsed out with an aqueous solution of tannin, the solution gradually becomes purple and, on addition of sodium chloride, blue with precipitation of gold. With a greater amount of tannin, the solution becomes green to blue. If the vessel has been rinsed with an aqueous solution of stannous chloride and pyrogallol, the purple colour appears on warming. When dipped into a dilute gold solution and heated in the benzene flame, a borax bead becomes ruby coloured; on longer heating, blue; and in presence of traces of gold, finally, colourless.

Silk and cotton fibres, treated either with tannin or with stannous chloride and pyrogallol, are used for the microchemical detection of gold. The silk fibres are coloured red with colloidal gold. The cotton wool shows a blue or dark coloration due to a suspension of gold particles. The most delicate reaction (detection of 0·000002 milligram of gold) is obtained with silk treated with stannous chloride and pyrogallol. These colours are destroyed by chlorine or bromine water, but not by acids or alkalis. The coloration of the silk fibre is prevented by the presence of free bases, concentrated mineral acids, arsenious or arsenic acids, silicates, free halogens, reducing agents, tartar emetic, or antimonates. Silver salts form, in the fibres, a yellow colour which disappears on adding nitric acid. G. Y.

Assay of Platinum, Gold and Silver Alloys. Auguste Hollard and L. Bertiaux (*Ann. Chim. anal.*, 1904, 9, 287—292).—A criticism of the method used by the French assayers which, although giving approximately the amount of gold and platinum, fails to indicate the true percentage of silver. The author states that the amount of gold actually found is generally 0·002 gram too low.

The silver may be accurately estimated as follows. A few decigrams of the alloy are dissolved in a mixture of 1 vol. of nitric and 5 vols. of hydrochloric acid and evaporated to a syrupy consistency. The residue is then freed from hydrochloric acid by evaporating twice with nitric acid. It is then dissolved in a few c.c. of water, mixed with two drops of hydrochloric and 2 c.c. of nitric acid, and, after boiling, diluted to 150 c.c. The silver chloride is then collected, dissolved in 30 c.c. of a 20 per cent. solution of potassium cyanide, and the metal is deposited electrolytically with the usual precautions. Its purity is ascertained by titration with thiocyanate as usual. L. de K.

Use of Pumice to facilitate the Combustion of Organic Substances. Maurice Duyk (*Ann. Chim. Anal.*, 1904, 9, 252—254).—The refractory substance (albumins, yeast, wool, &c.) is mixed with an equal weight of pumice (mesh 5) and then incinerated in a muffle or over a Bunsen flame. An ash free from carbon is thus obtained, which may be separated from the pumice by suitable solvents. L. de K.

A Frequent Source of Error in the Analysis of Coal. Just Alix and Isidore Bay (*Compt. rend.*, 1904, 139, 215—216).—Samples of coal from the Montrambert mines were found to contain 5 per cent. of calcium carbonate. Combustion of such coal, for the purpose of estimating the carbon, causes the carbonate to dissociate, and, in consequence, the percentage amount of carbon, calculated from the weight of carbon dioxide obtained, is greater than that corresponding with organic carbon. H. M. D.

Analysis of Solid Fuels. E. GOUTAL (*Ann. Chim. anal.*, 1904, 9, 242—246).—The author points out two important sources of error in the calorimetric assay of fuels, namely, the presence of much slate and the use of commercial oxygen containing hydrogen.

Slate may be removed by treating the sample with a heavy liquid composed of 3 vols. of methylene iodide and 1 vol. of benzene. The coal thus freed from slate is washed with benzene and dried. Any error caused by the presence of hydrogen in the oxygen employed may be avoided by passing the latter through a copper tube heated to redness. L. DE K.

Estimation of Methoxyl Groups. WILHELM KROPATSCHEK (*Monatsh.*, 1904, 25, 583—592. Compare Gregor, Abstr., 1898, ii, 490; Moll van Charente, Abstr., 1902, ii, 434).—The crystalline substance obtained by Moll van Charente from Gregor's absorbent for hydrogen iodide (potassium arsenite) employed in the estimation of methoxyl groups is KI,As_4O_6. This compound is not formed, and methyl iodide is not retained by this solution if not more than a 2 per cent. solution of potassium arsenite is used.

The error supposed to be due to the carrying over of amorphous phosphorus is caused by the presence of hydrogen phosphide in the hydriodic acid, and can be avoided by using hydriodic acid prepared by boiling iodine with formic acid in a reflux apparatus. Gregor's absorbent retains hydrogen phosphide. G. Y.

Estimation of Methyl Alcohol in Commercial Formaldehyde. MILAN J. STRITAR (*Zeit. anal. Chem.*, 1904, 43, 401—403).—Commercial formalin is diluted with 20 volumes of water and treated with an excess of ammonia. The mixture is distilled until about half has passed over. The distillate, which contains only traces of formaldehyde, is feebly acidified with acetic acid, and a convenient portion submitted to Zeisel's iodide process. Two samples of commercial formalin showed respectively 16·5 and 15·1 grams of methyl alcohol in 100 c.c.

M. J. S.

Estimation of Methyl Alcohol by the Iodide Process, especially in the Products of the Distillation of Wood. MILAN J. STRITAR and H. ZEIDLER (*Zeit. anal. Chem.*, 1904, 43, 387—400).—Methyl alcohol in dilute aqueous solution can be estimated with the greatest accuracy by Zeisel's iodide process (Abstr., 1886, 493). The only substances occurring in wood-spirit which could interfere with this estimation are allyl alcohol, methyl acetate, methylal, acetaldehyde, formaldehyde, acetone, guaiacol, creosol, and the dimethyl ethers of pyrogallol and its homologues.

Of these, allyl alcohol yields *iso*propyl iodide and the corresponding amount of silver iodide. Its amount must therefore be determined by the bromine addition method and due allowance made. The amount of formaldehyde in wood-spirit is very small, and its conversion into methyl iodide is so slow compared with the rapid reaction of methyl alcohol that the error it causes may be neglected. Acetaldehyde and acetone yield no volatile iodide, methylal gives 2 molecules of silver iodide, but no method is known by which a correction can be applied. Methyl acetate also yields silver iodide corresponding with its methoxyl group. A correction may be obtained from the esterification number of the wood-spirit by estimating the ester value. Guaiacol and the other phenol ethers can be eliminated by shaking with animal charcoal. The charcoal absorbs a little methyl alcohol, but this can be recovered by a slight washing.

The method of analysis employed is therefore as follows: of crude wood-spirit, 5 c.c. are diluted to 500 c.c., and 5 c.c. of this mixture are submitted to the iodide process. The weight of silver iodide multiplied by 272·94 gives grams of methyl alcohol per 100 c.c. Of aqueous wood-spirit containing less than 10 per cent. of methyl alcohol, 10 c.c. are diluted to 50 c.c., shaken for $\frac{1}{4}$ hour with 0·5 gram of charcoal, filtered through a small, moistened filter, the charcoal washed, and the filtrate made up to 100 c.c. Of crude pyroligneous acid, 50 c.c. are neutralised with sodium carbonate, made up to 250 c.c., and filtered through an unmoistened paper filter; 100 c.c. are then made strongly alkaline with sodium hydroxide and distilled until 50 c.c. have been collected. Dilute aqueous solutions of methyl alcohol can be distilled without loss. The distillate is treated with charcoal, &c., as above.

M. J. S.

Analysis of a Mixture of Sucrose, Dextrose, and Lævulose. Emil Remy (*Chem. Centr.*, 1904, 1, 1672; from *Bull. Assoc. Chim. Sucr. & Dist.*, 21, 1902—1906).—Buisson estimates the three sugars by a polarimetric observation before and after inversion and an estimation with Fehling's solution. The process is criticised, and other formulæ are given instead.

L. de K.

Testing the Stability of Nitrocellulose. E. Bergmann and Aloys Junk (*Zeit. angew. Chem.*, 1904, 9, 982—984, 1018—1023, 1074—1077).—A lengthy and fully illustrated article unsuitable for adequate abstraction. The degree of stability is judged by measuring the nitrogen oxides evolved during two hours' heating at 132°. The method is somewhat interfered with by the presence of sodium or calcium carbonate.

L. de K.

New Reagents for Aldehydes. Maurice Prud'homme (*Bull. Soc. Ind. Mulhouse*, 1904, 74, 169—170).—The well-known Schiff's reagent for the detection of aldehydes consists of an acid solution of magenta decolorised by means of sulphurous acid. The author has greatly improved the delicacy of the test by substituting for the sulphite a solution of sodium hyposulphite prepared by the action of zinc dust on sodium hydrogen sulphite.

Another reagent is prepared by decolorising an acid solution of diazomagenta by hyposulphite. The first reagent is valuable for the detection of benzaldehyde, which is scarcely affected by Schiff's reagent. A fine violet colour is obtained.

L. de K.

Detection of Formalin in Milk. J. Eury (*Ann. Chim. anal.*, 1904, 9, 254).—A modification of Hehner's method, which avoids the charring action of the sulphuric acid.

Five c.c. of milk are mixed with 5 c.c. of dilute sulphuric acid (1 : 1) and 5 drops of a 1 per cent. solution of ferric chloride and then heated to boiling. If formalin is present, a violet colour appears which persists for about five minutes; the mixture then turns brown. One mg. of formalin may thus be detected in a litre of milk.
L. DE K.

The Iodoform Reaction for Citric Acid. T. C. N. BROEKSMIT (*Chem. Centr.*, 1904, i, 1671; from *Pharm. Weekbl.*, 1904, 41, 401—404).—Citric acid in aqueous solution may be detected by heating with potassium permanganate, adding ammonia, and then tincture of iodine, which causes a precipitate of iodoform. In the presence of other substances it is advisable to precipitate the acid by means of ammonia, barium chloride, and alcohol. The barium citrate, after being washed with alcohol, is then dissolved in boiling dilute acetic acid and identified as described. L. DE K.

The Orcinol Test for Glycuronic Acid. E. C. VAN LEERSUM (*Beitr. chem. Physiol. Path.*, 1904, 5, 510—512).—Doubt is cast on the trustworthiness of this test. W. D. H.

Estimation of Fat in Cheese by Gerber's Method. MORITZ SIEGFELD (*Milch-Zeit.*, 1904, 33, 433—435).—Results obtained by various modifications of this method are given. The modifications included the use of different forms of graduated tubes and the substitution of hydrochloric for sulphuric acid as a solvent of the cheese.

Very concordant figures were obtained in all cases. It was found impossible, however, to estimate the fat in highly decomposed cheeses by this method, owing to the formation of a persistent clotted layer between the acid solution and the separated fat. W. P. S.

Presence of Lecithin in Wine. AUGUSTE ROSENSTIEHL (*Chem. Zeit.*, 1904, 28, 663—664).—A reply to Ortlieb and Weirich (this vol., ii, 304), who maintain that lecithin is the only efficacious constituent of wine. Ortlieb and Weirich detected lecithin in Thyra wine only, but they have not examined ordinary wines for its presence; the conclusions they draw are based on insufficient data. Although lecithin is decomposed on evaporating its concentrated solution, it is quite stable in dilute solution, which may be concentrated by evaporation at 95°. A. McK.

General and Physical Chemistry.

Evidence for the Possibility of Resolving an Optically Active Compound without direct Fission and without the Aid of Optically Active Substances. ERNST MOHR (*Ber.*, 1904, 37, 3470. Compare this vol., i, 653).—The priority of Kipping is conceded (compare Kipping and Hall, Trans., 1901, 79, 442; Kipping and Salway, 1904, 85, 438). J. J. S.

Spectro-analytical Recognition of Argon in Atmospheric Air. EMIL WARBURG [with LILIENFELD] (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 1196—1197).—The sensitiveness of ordinary flame reactions is not influenced by the presence of other substances, but it is far otherwise in the case of the emission of light by gases in vacuum tubes. Thus 37 per cent. of argon in nitrogen is scarcely perceptible. The nature of the light emission is, however, greatly dependent on the current, and the author describes an arrangement by which the argon lines can be easily recognised in atmospheric air at 3 mm. pressure.
L. M. J.

Discontinuous Glow Spectra of Solid Organic Substances. EUGEN GOLDSTEIN (*Chem. Centr.*, 1904, ii, 286; from *Verh. Deut. physikal. Ges.*, 6, 156—170. Compare Abstr., 1903, ii, 524).—Many solid aromatic substances, even of those containing only carbon, hydrogen, and oxygen, exhibit a discontinuous spectrum when exposed to the action of the cathode rays at the temperature of liquid air. If the discharge is stopped, there is a discontinuous after-glow spectrum, which is particularly bright for a short time after the removal of the liquid air. Discontinuous spectra are more readily obtained from substances with two or more rings (heterocyclic as well as carbocyclic) than from those with only one ring. Some substances, however, with two or three rings, especially nitro-derivatives, show no discontinuous spectrum.

Replacement of a hydrogen atom by a group consisting of carbon and hydrogen atoms produces little effect; replacement by other elements produces a marked effect on the type of the spectrum. So far as the character of the maxima and their general arrangement is concerned, the spectrum type is the same for position isomerides, although the absolute position, and sometimes the number, of the maxima differs from one isomeride to another. It is noteworthy that mercury lines cannot be detected in the spectrum of mercury diphenyl.

There is no essential difference in these spectrum phenomena at ordinary and at low temperatures, but cooling is to be recommended in order to prevent sublimation and decomposition. The fluorescence exhibited by solutions of many of the substances investigated has nothing to do with the spectra of the solid substances, for the fluorescence spectra of the solutions are continuous. The absorption spectra do not correspond with the emission spectra, for the phosphorescence of the substances depends on a change brought about by their exposure to the rays. J. C. P.

Emission Spectra of Aromatic Compounds. Eugen Goldstein (*Chem. Centr.*, 1904, ii, 286; from *Verh. Deut. physikal. Ges.*, 6, 185—190. Compare previous abstract).—Although a discontinuous spectrum is more readily obtained from substances with two rings in the molecule (phthalic and benzoic acids give a continuous, their anhydrides a discontinuous, spectrum), still there are substances with one ring (hydrocarbons, specially the xylenes, and phenols) which exhibit a discontinuous spectrum, either while they are exposed or afterwards. Benzoic, *p*-hydroxybenzoic, anisic, and terephthalic acids and phenol give primarily a continuous spectrum, whilst that of the afterglow is discontinuous. The colours are different in the two cases; sometimes they appear together, and then the intensity of the one falls off more rapidly than that of the other. The spectrum type is the same for ortho-, meta-, and para-compounds. J. C. P.

Phosphorescent Substances. Karl A. Hofmann and W. Ducca (*Ber.*, 1904, 37, 3407—3411. Compare Becquerel, this vol., ii, 6; Tommasina, this vol., ii, 7).—Phosphorescent zinc sulphide is obtained by Henry's method (Abstr., 1893, ii, 72) from commercial zinc chloride, but not from chemically pure zinc ammonium sulphate. If 5 grams of sodium chloride and 0·2—0·5 gram of magnesium chloride are added to 20 grams of pure zinc ammonium sulphate dissolved in 400 c.c. of water, and the precipitate, with hydrogen sulphide, is dried without being washed, the yellow, crystalline zinc sulphide, which remains after heating, is highly phosphorescent. Contrary to Henry's statement, the phosphorescence must be due to the presence of traces of the sodium and magnesium salts. The addition of sodium chloride or of magnesium chloride alone does not cause the phosphorescence. The presence of traces of iron, nickel, cobalt, bismuth, chromium, or copper salts diminishes, but traces of salts of tin, selenium, manganese, or cadmium increase the effect. G. Y.

The Ring-system of Benzene. VI. Fluorescence. Hugo Kauffmann (*Ber.*, 1904, 37, 2941—2946. Compare Abstr., 1900, i, 480; 1901, i, 318; 1903, i, 19).—Compounds showing violet fluorescence in alcohol or acetic acid solution show a violet luminescence when their vapour is exposed to Tesla-rays. This conclusion is confirmed by the examination of a large number of ring-compounds. The luminescence and fluorescence are found to be increased by the introduction of carbethoxyl groups in the ortho-position.

Ethyl dihydrocollidinedicarboxylate is fluorescent in the solid state or in glacial acetic acid solution, but not in alcohol, ether, or benzene. In this and similar compounds, the violet emission is connected with the presence of parallel double linkings.

Compounds with green fluorescence are not in most cases volatile without decomposition, and it has not therefore been possible to compare the colour of the luminescence. C. H. D.

Radium Rays and Benzene Derivatives. HUGO KAUFFMANN (*Ber.*, 1904, **37**, 2946—2948. Compare preceding abstract).—Solid aromatic compounds were exposed in a thin layer to the action of radium rays. In the majority of cases, fluorescence is produced, this being especially the case with polynuclear compounds and those which become luminescent in vapour under the influence of Tesla-rays. Ethyl dihydrocollidine- and dihydrolutidine-dicarboxylates fluoresce almost as strongly as platinicyanides. Coloured compounds, such as azobenzene, nitroanilines, diphenylaminoquinoxaline, and ethyl *o*-aminocinnamate, do not respond, although the two latter compounds are fluorescent with light. The β-rays appear to be the exciting cause.
C. H. D.

Determination of the Intensity of β-Rays and Some Measurements of their Absorption. WILHELM SEITZ (*Chem. Centr.*, 1904, ii, 581; from *Physikal. Zeit.*, **5**, 395—397).—The intensity of β-rays has been determined by measuring the negative charge which an insulated plate suspended in a vacuum received when exposed to the rays. The preparation was placed between mica plates outside the vacuum apparatus, which was closed by aluminium foil. By means of a simple arrangement, the contact between the plate and the electrometer after exposure to the rays could be broken in the vacuum. In measuring absorption, the substance was placed between mica and aluminium foil. It was found that when 7 mg. of Buchler's radium bromide were placed in layers of tinfoil, the absorption-coefficient decreased as the thickness of the layers was increased, because the rays emitted by this substance are not homogeneous. About 0·29 per cent. of the rays pass through lead plates of 3 mm. thickness (compare Paschen, this vol., ii, 461). Lenard's law of the absorption of cathode rays holds approximately. The greater the atomic weight of the substance, the greater the absorption for equal masses per unit surface. Seven mg. of radium bromide yield continuously $5·6 \times 10^{-12}$ amperes in the form of γ-rays. E. W. W.

Coloration produced by Becquerel Rays. Application to Crystallography; Colorimetric Estimation of Radioactivity. C. J. SALOMONSEN and G. DREYER (*Compt. rend.*, 1904, **139**, 533—535).—Plates of quartz exposed to the action of radium salts become strongly coloured. The minute examination of such plates cut perpendicular to the optical axis shows the presence of a system of lines and striæ parallel with the binary axes of the crystal. Adjacent portions of the striated system differ considerably in the intensity of the coloration, and exposure of the quartz to radium thus shows clearly its heterogeneity of structure.

The coloration of glass by Becquerel rays affords a means of quantitative measurement, a scale of standards being easily obtained by exposing the glass to pure radium salt for different times. The sensitiveness of the glass depends on the composition. Jena borosilicate crown glass (No. 3453) was found to be particularly sensitive.

H. M. D.

Becquerel Rays and Water. Friedrich Kohlrausch (*Chem. Centr.*, 1904, ii, 296; from *Verh. Deut. physikal. Ges.*, 5, 261—262).—The conductivity of water exposed to radium rays increases more rapidly than that of water contained in the same vessel, but not similarly exposed. This additional increase of conductivity in the case of the exposed water corresponds with an increase in the ions of about 1/5000th mg. per day. The ions may be produced from the water by the exposure, or the rays may accelerate the solution of the glass. If a current of air is led over the radium salt and then through the water, the latter shows no increase of conductivity. J. C. P.

Action of Radium Emanations on Diamond. Sir William Crookes (*Proc. Roy. Soc.*, 1904, **74**, 47—49).—An "off colour" diamond, of a very pale yellow colour, was put inside a tube with radium bromide and, after 78 days, the diamond had darkened and become bluish-green in tint, no yellow colour being apparent. When heated at 50° in a mixture of nitric acid and potassium chlorate for 10 days, the diamond lost its dull surface colour and was bright and transparent, but its tint had changed to a pale bluish-green.

The radium emanations have accordingly a double action on the diamond. The β-rays effect a superficial darkening, converting the surface into graphite in a manner similar to, but less strongly than, the more intense electrons in the cathode stream.

In the presence of radium, the diamond is extremely phosphorescent, and continues to shine during the time of the experiment.

The diamond which had been submitted to the action of radium was still strongly radioactive after it had been away from radium for 35 days, for 10 of which it was being heated in a mixture powerful enough to dissolve its outer skin of graphite. A. McK.

Chemical Actions of Radium. Giovanni Pellini and M. Vaccari (*Atti R. Accad. Lincei*, 1904, [v], **13**, ii, 269—275).—A glass tube containing 5 mg. of radium bromide and covered with thin aluminium foil was sealed up in an outer glass tube and immersed in various reacting solutions. It was found that after some time the walls of the outer glass tube became coloured violet, the intensity of the coloration being irregularly distributed over the glass.

The author's experiments show that not all the chemical reactions induced by light, even the most sensitive ones, are brought about by the action of radium. Radium seems to favour processes of oxidation, such as that of hydriodic acid. T. H. P.

Chemical Action of Radiations of Short Wave-length on Gaseous Compounds. Emil Warburg [with E. Regener] (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 1228—1231).—It has been shown that the silent discharge possesses both ozonising and deozonising action, and experiments were made to measure these actions in the case of radiations of short wave-length obtained from a spark discharge. As the deozonising action is but little reduced when the discharge occurs in a thin-walled glass tube, the wave-length of the active rays is under 0·3 μ. Curves for the ozonising and deozonising action were obtained and indicate an equilibrium at about 2·2 per cent. ozone, but this is dependent on the condition of the quartz vessel employed, that is, on its permeability to the ozonising and deozonising rays. With the same apparatus, ammonia gas was decomposed to the extent of 11 per cent. with but little decrease of velocity. Nitric oxide and nitrous oxide were also decomposed (see Abstr., 1900, ii, 721).

L. M. J.

Chemical Action of the Cathode Rays. Emil Bose (*Chem. Centr.*, 1904, ii, 173; from *Physikal. Zeit.*, 5, 329—331. Compare Wiedemann and Schmidt, Abstr., 1898, ii, 291; Schmidt, Abstr., 1902, ii, 237).—When a very strong potassium hydroxide solution (surface = 200 sq. cm.) is exposed in vacuum to the action of a cathode discharge, there are found subsequently in the gaseous phase both hydrogen and oxygen, the volume of the former being considerably more than twice that of the latter. This excess of hydrogen is 10 to 30 times as great as the amount simultaneously produced in a hydrogen voltameter under reduced pressure. The cathode rays, therefore, not only produce an electrochemical effect according to Faraday's laws, but give rise to chemical action in some other way. The most probable source of this is the kinetic energy of the cathode rays, and a computation shows that this is indeed sufficient to produce far greater chemical effects than the electricity carried with the rays, although of course a large proportion of the mechanical energy referred to is doubtless transformed into heat directly. That in the experiments described above such a large excess of hydrogen was obtained is due to the greater solubility of oxygen, and the electrolyte was shown in several cases to retain considerable quantities of that gas.

Generally speaking, the purely chemical action of the cathode rays is electrochemical; those changes such as the coloration of alkali haloids, which have not been shown to be chemical in character or which can be reversed by the heating action of the rays, are probably dissociation effects due to the dynamic action of the rays. This dynamic action will be still greater than the chemical action in the case of the Becquerel rays.

J. C. P.

Phenomena observed in Air Ionised by Radioactive Substances. Augusto Righi (*Atti R. Accad. Lincei,* 1904, [v], 13, ii, 233—240).—The author describes a sensitive electroscope for comparing the radioactivities of different substances. It consists of a box, the two sides and the top and bottom faces of which are of brass, whilst the two ends are of glass lined with metal gauze. To facilitate the entry of the active rays, the bottom face and one side face are provided with circular windows of thin aluminium. Passing through the top of the box are: (1) a metal rod, carrying at its end a rod of insulating material (fused quartz, sulphur, or amber), to which is attached a slender gold leaf about 10 mm. wide; (2) a metal wire passing down a glass tube and carrying a strip of silvered copper, which is about 1 mm. wide, and is bent so as nearly to touch the gold leaf. When this wire is in permanent communication with the insulated pole of a dry battery or of a battery of a few accumulators, the gold leaf is attracted to the metal strip and then repulsed. On bringing a radioactive substance near to the instrument, the gold leaf falls and touches the metal strip, is then repelled, falls again, and so on. It is found that the intensity of the radioactivity is inversely proportional to the duration of one of these oscillations. The orientation of the radioactive substance with regard to the apparatus influences considerably the period of oscillation. T. H. P.

Ionisation of Gases and Vapours caused by Polonium Rays. Cäcilia Böhm-Wendt (*Chem. Centr.*, 1904, ii, 873—874; from *Physikal. Zeit.*, 5, 509—511).—The ionisation caused by the complete absorption of polonium rays (Marckwald's radiotellurium) by various gases has been directly determined for high and low *E.M.F.*, or calculated by extrapolation. In a small vessel in which the absorption is incomplete, the saturation current is dependent on the density of the gas, but with larger vessels in which there is practically total absorption, the ionisation is independent of the nature of the gas, the saturation current being the same in all cases. Air, coal gas, carbon dioxide, and mixtures of air with benzene, toluene, chloroform, or ether have been examined. Ether shows an exceptional behaviour; the current intensity for high *E.M.F.* is constant for the same gaseous mixture, but has an abnormally low value. The *E.M.F.* required for the saturation current increases with lapse of time. The ions first formed possibly act as nuclei for condensation, and become less mobile as their mass increases. E. W. W.

Radioactive Gas obtained from Crude Petroleum. E. F. Burton (*Chem. Centr.*, 1904, ii, 874; from *Physikal. Zeit.*, 5, 511—516).—A petroleum from Petrolia, Ontario, which rises from a stratum of calcium carbonate at a depth of about 150 metres, has been found to yield a radioactive gas. A gaseous mixture of sp. gr. 1·05 compared with air was obtained by aspirating air through the hot petroleum. The conductivity of the gaseous mixture increased for about 3 hours, attaining a maximum which was about 40 per cent. greater than its initial value, but in 3·12 days it decreased to about half. The results obtained are practically in accordance with a potential law, the variations with time being independent of the initial potential. In the exponential function $J_t = J_0 e^{-\lambda t}$, the value of $1/\lambda$ increases continuously, probably because the gas contains a trace of a radioactive substance which is more stable than the emanation. The mean values of $1/\lambda$ were found to be approximately equal to those obtained when pure radium compounds were employed. The activity of fresh air which has been passed through the petroleum gradually decreased, but even after a month it had not completely disappeared, the conductivity being then about 1·6 times the normal value. The petroleum may contain a trace of radium itself. The induced radioactivity decreases in geometrical ratio, falling to half in 35 minutes. E. W. W.

Radioactivity of Soils and Well Sediments. JULIUS ELSTER and HANS GEITEL (*Chem. Centr.*, 1904, ii, 174; from *Physikal. Zeit.*, 5, 321—325).—The radioactivity of numerous samples of the above has been detected and measured. J. C. P.

Mercury Sulphate and Standard Cells. GEORGE A. HULETT (*Zeit. physikal. Chem.*, 1904, 49, 483—501).—It is known that the *E.M.F.* of the Weston cell varies with the method of preparing the mercurous sulphate required. The author has studied the extent of this variation, and recommends an electrolytic method of preparing the sulphate. Sulphuric acid is electrolysed with a platinum cathode and a mercury anode, and the mercurous sulphate formed is prevented by a stirrer from settling on the anode. When this mercurous sulphate is used in the preparation of a Weston cell, the *E.M.F.* is constant from the first, and has exactly the same value in different cells, namely, 1·01908 volts at 21·1°.

By shaking mercuric sulphate and dilute sulphuric acid with mercury for some time, the same equilibrium is reached as when mercurous sulphate alone is used. It is shown that mercuric sulphate is present in the cell, and analysis gives the ratio $Hg^{\cdot}/Hg^{\cdot\cdot} = 40$, a much smaller value than that found by Abel (Abstr., 1901, ii, 376). The experiments indicate that mercurous sulphate is affected by the cadmium sulphate solution, and accordingly the hydrolysis of the former salt has been studied in detail. After prolonged shaking with mercury and water, the water being renewed at intervals, the residue has an exceedingly small solubility, and analysis indicates that the compound $HgHSO_4$ has been slowly removed and that the residue consists of a basic salt, thus: $3Hg_2SO_4 + 2H_2O \rightleftharpoons (HgOH)_2,Hg_2SO_4 + 2HgHSO_4$ (compare Gouy, Abstr., 1900, ii, 481). If this basic salt is substituted for pure mercurous sulphate as the depolariser in a Weston cell, the *E.M.F.* is considerably greater than the value given above. The author has determined also the solubility of mercurous sulphate in sulphuric acid solutions of various concentration, and finds a marked discontinuity at the concentration $v = 1$. This indicates that the mercurous sulphate used in the standard cells should be prepared from sulphuric acid of greater concentration than that just referred to.

It is shown in the paper that mercurous salts may conveniently be estimated as chloride by precipitating with a slight excess of a dilute chloride solution and drying the mercurous chloride obtained in a vacuum desiccator for 12—24 hours. J. C. P.

[Standard Cells.] NORMAN T. M. WILSMORE (*Zeit. Elektrochem.*, 1904, 10, 685).—To prevent the glass breaking at the point at which the platinum wire making contact with the zinc or cadmium amalgam is sealed through it, the author places the platinum wire at the end of a short, narrow tube, which is filled with asbestos, so that the amalgam does not come in contact with the platinum close to the place at which it passes through the glass. Figures are given of two convenient forms of mercury electrodes. The improvement consists in using a two-way tap, of the kind used on gas pipettes, instead of the usual plain syphon for connecting the electrode to other electrodes.

T. E.

The Carbon Cell. Fritz Haber and Ludwik Bruner (*Zeit. Elektrochem.*, 1904, 10, 697—713).—Carbon and iron immersed in fused sodium hydroxide give a difference of potential of about a volt, the current flowing from carbon to iron in the electrolyte. The chemistry of the cell is not definitely known. Iron immersed in fused sodium hydroxide is at first rapidly dissolved. In some circumstances, however, it becomes passive. If the iron is immersed in fused sodium nitrate, it is covered with a dark skin of oxide, which is difficult to remove; such iron is passive. Addition of manganate to the sodium hydroxide also produces the passive condition, and the more readily the less water the sodium hydroxide contains. This is explained by the fact that dry sodium hydroxide does not yield any hydrogen when electrolysed, and therefore, since no hydrogen can be evolved at the surface of the iron, the skin of oxide is formed more completely. Since all sodium hydroxide, especially when fused in contact with iron and air, contains more or less manganate, it appears that iron protected by a skin of oxide and immersed in sodium hydroxide containing manganate is really an oxygen electrode, the part played by the manganate being that of an intermediary, by means of which the atmospheric oxygen can pass into the ionic condition.

In order to measure the potential of the iron and carbon electrodes in fused sodium hydroxide, the standard $N/10$ calomel electrode was connected to the fused electrolyte by a stick of solid sodium hydroxide, one end of which touched the fused electrolyte, the other end being attached to the syphon of the calomel electrode by a piece of rubber tubing. The end of the syphon in direct connection with the stick of sodium hydroxide was filled with gypsum soaked in sodium hydroxide solution. The *E.M.F.* of the combination, passive iron in sodium hydroxide | calomel electrode, was found to be $-0·265$ volt at 312°, increasing to $-0·472$ volt at 532°. This *E.M.F.* is independent of the quantity of manganate in the electrolyte if this is not very small or very large.

The *E.M.F.* of the combination, carbon in fused sodium hydroxide | calomel electrode, varies very much with the nature of the carbon employed, $-0·66$ volt being found with artificial graphite and $-1·4$ volts with a partially disintegrated arc-lamp carbon. The carbon is attacked by fused sodium hydroxide, hydrogen being evolved. The more rapid the evolution of hydrogen, the greater is the *E.M.F.* When a very rapid evolution of hydrogen is produced by heating the sodium hydroxide to 500°, the *E.M.F.* rises to $-1·5$ volts. When a platinum tube through which a current of hydrogen is passed is substituted for the carbon electrode, the same *E.M.F.* is observed, namely, $-1·48$ to $-1·5$ volts. It appears therefore that the carbon electrode is really a hydrogen electrode. That *E.M.F.*s lower than $-1·5$ volts are often observed is readily explained by the partial depolarisation of the electrode by the manganate present in the electrolyte. It is only when the temperature is sufficiently high to produce a rapid evolution of hydrogen that the full value is observed. When the carbon is once charged with hydrogen, however, it retains the high *E.M.F.* for some time at lower temperatures.

The possibility that, by the action of atmospheric oxygen, the carbon may first be oxidised to carbon monoxide, and that this may react with sodium hydroxide to form formate or oxalate, is also considered.

It is shown that carbon and sodium hydroxide react, giving pure hydrogen. Sodium formate and sodium hydroxide, when fused together, give off pure hydrogen, the reaction begins at about 205° and is quite complete at 350°; it is represented by the equation

$$NaCO_2H + NaOH = H_2 + Na_2CO_3.$$

No oxalate is formed. A mixture of sodium oxalate and sodium hydroxide begins to decompose at 270—280°, evolving pure hydrogen and forming carbonate only. If the potential of the carbon electrode were due to the presence of either formate or oxalate, it should be higher than the hydrogen potential, because both formate and oxalate break up spontaneously yielding hydrogen. Measurements of the potential of carbon in sodium hydroxide to which formate or oxalate had been added, and from which hydrogen was being evolved owing to their decomposition, always gave the hydrogen potential $-1{\cdot}5$ volts. The action of carbon monoxide on sodium hydroxide at 350° was found to be $2NaOH + CO = Na_2CO_3 + H_2$.

It is therefore proved that the carbon electrode is really a hydrogen electrode, the hydrogen being formed by the action of carbon on sodium hydroxide, and the reaction to which the *E.M.F.* of the cell is due is the formation of water from this hydrogen and atmospheric oxygen.

The *E.M.F.* of the cell agrees well with the *E.M.F.* required to decompose into hydrogen and oxygen the small quantities of water dissolved in fused sodium hydroxide. The application of Helmholtz's formula to the results leads to the conclusion that the vapour pressure of this dissolved water must be extremely small, but the values calculated are much affected by small experimental errors. T. E.

A Simple Standard Electrode. H. Danneel (*Zeit. Elektrochem.*, 1904, 10, 685).—A mercury electrode with a simple arrangement for filling and rinsing out the syphon. T. E.

Behaviour of Unattackable Anodes in the Electrolysis of Hydrochloric Acid. Emil Bose (*Zeit. physikal. Chem.*, 1904, 49, 227—228).—Many of the points raised in Luther and Brislee's paper (Abstr., 1903, ii, 708) have already been dealt with by the author (Abstr., 1899, ii, 348). J. C. P.

Anodic Evolution of Oxygen. Fritz Foerster and A. Piguet (*Zeit. Elektrochem.*, 1904, 10, 714—721).—Smooth matt and platinised platinum, smooth iridium, paladium, nickel and iron electrodes were used as anodes in potassium hydroxide solution. The current was kept constant at 0·033 ampere per. sq. cm. and the *E.M.F.* measured from time to time. The cathode being of platinised platinum, the whole of the change of *E.M.F.* takes place at the anode. In every case, the *E.M.F.* rises more or less rapidly, finally attaining a constant value which is different for each electrode. The platinum metals gave the same result in sulphuric acid. The differences observed are similar to those found with currents which are just capable of producing a visible evolution of gas, but are much larger. The authors incline to the hypothesis that they are due to the formation of a thin layer of absorbed gas on the surface of the electrode. T. E.

Electrolytic Separation from their Salt Solutions of Metals which decompose Water.

A. SIEMENS (*Zeit. anorg. Chem.*, 1904, 41, 249—275).—A metal which decomposes water can be separated electrolytically from the aqueous solution of one of its salts either if the supertension of hydrogen towards it is considerable or if it can be depolarised. In the first case, the Nernst formula, $RT/n.\log C_{M}c_{M} = RT.\log C_{H}/c_{H} + \eta$, is applicable; if the value for the left side of the equation is smaller than, or equal to, that for the right side, the metal will separate, whilst if it is greater, hydrogen will separate. With metals of higher supertension than zinc, the value for the right side of the equation is always greater than that for the left; those metals may, however, separate if a suitable depolariser be used, and in this case this equation becomes $RT/n.\log C_{M}c_{M} - \theta = RT.\log C_{H}/c_{H} + \eta$, where θ represents the value of the depolarisation. In this way, metals of the alkalis or alkaline earths may be separated from their aqueous solutions when mercury is the cathode.

Magnesium separates along with nickel when solutions of mixtures of magnesium sulphate and nickel sulphate are electrolysed, the anode being nickel and the cathode platinum, only, however, when the concentration of the magnesium salt in the electrolyte is high. When the concentration of the magnesium salt is low, and especially when an ammonium salt is present, a quantitative electrolytic separation of magnesium from nickel is possible. The influence of concentration, temperature, and current density on the separation of nickel, together with magnesium, was investigated. Similarly, magnesium can be electrolytically separated along with cobalt, to a less extent with iron, and very slightly with zinc. Aluminium and metals of the alkaline earths cannot be separated, together with heavy metals, from aqueous solutions. Alkali metals separate in traces, along with nickel and tin, from aqueous solutions, but not along with iron and silver. No alloys of definite composition were in any case obtained, the heavy metal simply serving as solvent for the light metal. The high potentials of the precipitates deposited from mixed salt solutions are a proof of the presence of the light metals.

Nickel magnesium sulphate in aqueous solution does not form complex ions; it differs in this respect from nickel ammonium sulphate. Salts of the alkalis and alkaline earths in acetone solution are reduced to the corresponding metals, but this is not the case with salts of magnesium, aluminium, and glucinum. A. McK.

Electric Potential of Nickel and Tellurium. Hans Euler (*Zeit. anorg. Chem.*, 1904, **41**, 93—96).—In the electrometric investigation of complex nickel salts, it is necessary to use nickel electrodes, which exhibit a constant potential towards nickel salts; the best electrodes were found to be those with a rough-grained surface. They are treated first with dilute sulphuric acid and then immersed in a $N/1$ nickel sulphate solution, being made alternately the anode and the cathode. When they are agitated for 4 days with $N/1$ nickel sulphate, they act as well as the best electrodes of the first order. The following potential differences were obtained:

$HgCl \mid NKCl - NNiSO_4/2 = +0{\cdot}466.$

$HgCl \mid NKCl - N/5NiSO_4/2 = 0{\cdot}472.$

If the potential of the calomel electrode be taken as $= 0{\cdot}560$ volt, then

$Ni \mid NNiSO_4/2 = -0{\cdot}094$ (whereas Neumann gives $-0{\cdot}022$) and

$Ni \mid N/5NiSO_4/2 = -0{\cdot}088.$

The following potential difference was obtained with tellurium electrodes.

$Te \mid$ saturated solution of telluric acid $- NKCl, HgCl = -0{\cdot}00$ volt. With other specimens, both higher and lower values were obtained.
A. McK.

Determination of a Transference Number in the Electrolysis of a Fused Salt. Richard Lorenz and G. Fausti (*Zeit. Elektrochem.*, 1904, **10**, 630—633).—A fused mixture of potassium and lead chlorides is used. Two small porous cells immersed in the fused salt form the anode and cathode compartments. The weight and composition of the salt contained in the cathode cell, and also the quantity of lead produced and the quantity of electricity passed, are determined. In every case it is found that the cathode liquid loses more lead than is deposited, hence the lead must be present in the fused electrolyte (at about 800°) in the form of a complex anion. With a mixture of equal molecules of potassium and lead chlorides, the value of the transference number for potassium found was about 0·3, but the results are very uncertain on account of the great experimental difficulties.
T. E.

Conductivity of Solutions of Sodium in Absolute Alcohols, in Alcohols diluted with Water, and in Mixtures of Two Alcohols. S. Tijmstra (*Zeit. physikal. Chem.*, 1904, **49**, 345—367).—The investigation, of which a preliminary notice has appeared (Abstr., 1903, ii, 628), has been continued. Solutions of sodium in absolute methyl alcohol conduct better than those in absolute ethyl alcohol, and the latter better than those in absolute propyl alcohol. The limiting value of the molecular conductivity cannot be actually determined in any of the three cases, neither can it be calculated by Ostwald's dilution law. Solutions in absolute propyl alcohol exhibit the peculiarity that the difference between successive values of the conductivity becomes greater as the dilution increases, owing probably to the great viscosity of the concentrated solutions. The conductivity of solutions in mixtures of ethyl and methyl alcohols, or in mixtures of methyl and propyl alcohols, can be calculated from the conductivities in the separate alcohols. The addition of water to solutions in ethyl alcohol increases the conductivity at all dilutions, whilst with methyl alcohol this is the case only with concentrated solutions; in the more dilute solutions, addition of water first diminishes the conductivity and then increases it, if in sufficient quantity. This is probably due to the migration velocity of the OCH_3' ion in methyl alcohol being greater than that of the OH' ion. J. C. P.

Conductivity of Solutions of Radium Bromide. FRIEDRICH KOHLRAUSCH and FRITZ HENNING (*Chem. Centr.*, 1904, ii, 296; from *Verh. Deut. physikal. Ges.*, 6, 144—146).—The specific conductivity of solutions of radium bromide has been determined at 18°, and the molecular conductivity has been calculated, the atomic weight being taken as 225. The value of Λ_∞ is about 125, and the ionic conductivity of $\frac{1}{2}$Ra is 57, comparable with that of $\frac{1}{2}$Ba, which is 56. The temperature-coefficient for the radium ion in water is 0·024 in the neighbourhood of 18°. If Runge and Precht's value for the atomic weight is taken, namely, 258, then $\Lambda_\infty = 135$, and the ionic conductivity of radium is 67. The behaviour of radium bromide, with its very high molecular weight, is a fresh example of the fact that the atomic weight is not an important factor in determining the behaviour of a salt towards water. J. C. P.

Conductivity of Aqueous Solutions of Electrolytes with Bivalent Ions. FRIEDRICH KOHLRAUSCH and E. GRÜNEISEN (*Sitzungsber. K. Akad. Wiss. Berlin*, 1904, 1215—1222).—The electrical conductivity was determined at concentrations varying from 0·0001N to N in the case of solutions of the chlorides of barium, magnesium, and calcium; nitrates of barium, strontium, calcium, and lead; the sulphates of potassium and lithium, and potassium oxalate. The values obtained are compared with those calculated by the equation $(L_0 - L)/L^p = c.m^{\frac{1}{3}}$, where L and L_0 are the conductivities at the concentration m and infinite dilution, p and c being constants. The observed and calculated values agree well between the concentrations 0·0005N and 0·2N. For high dilutions, however, the calculated values are considerably too high. The migration velocities are calculated as $\frac{1}{2}$Ba, 55·9; $\frac{1}{2}$Sr, 51·9; $\frac{1}{2}$Ca, 52·1; $\frac{1}{2}$Mg, 46·1; $\frac{1}{2}$Pb, 61·5; $\frac{1}{2}SO_4$, 68·7; $\frac{1}{2}C_2O_4$, 63·8. The conductivities of the sulphates of magnesium, zinc, cadmium, and copper, of calcium chromate, and of magnesium oxalate were also determined. The equation previously employed is not available, but at dilute solutions the results are in accord with those obtained from the equation $L_0 - L = P.m^{\frac{1}{2}}$, where P is a constant. This signifies that the difference between the conductivity and its limiting value is proportional to the square root of the concentration, or, if L/L_0 be regarded as the electrolytic dissociation, that the difference between the dissociation and unity is proportional to the square root of the concentration, and it is shown that the various values for L_0 recalculated by this expression are in good accord. The migration velocities are also calculated, and are about 1 per cent. less than those previously obtained. L. M. J.

Dissociation of Electrolytes in Alcoholic Solutions. T. GODLEWSKI (*Bull. Acad. Sci. Cracow*, 1904, 6, 239—276. Compare Abstr., 1893, ii, 257; 1898, ii, 154).—The numbers obtained for the electrical conductivity of eight organic acids in ethyl alcohol solution at 18° and at dilutions varying from 8 to 1024 litres are found to satisfy the dilution law. On account of the very feeble dissociation of the acids in ethyl alcohol, the dilution law assumes the simpler form $\mu^2/v = k\mu^2_\infty$. On account of the uncertainty attaching to the absolute values of μ_∞, the values of the dissociation constant k are not sufficiently well established, and, for the purpose of comparing the different acids, the values of $k\mu^2_\infty$ are taken and compared with the corresponding numbers for the acids in aqueous solution at 25°.

	Cyanoacetic.	Phthallic.	Malonic.	Bromoacetic.	*o*-Nitrobenzoic.	Chloroacetic.	Salicylic.	Acetic.
Ethyl alcohol, $k\mu^2_\infty.10^4$ ...	11·6	9·49	7·96	3·35	3·10	2·66	2·66	[0·043]
Water, $k\mu^2_\infty$ ...	888	538	235	231	200	172	151	2·7

The relative values of the dissociation constants of the acids differ considerably in the two solvents. The two dibasic acids are especially notable in this respect.

The conductivities of potassium iodide, potassium chloride, sodium chloride, hydrochloric acid, sodium salicylate, and sodium cyanoacetate have been measured in aqueous alcoholic solutions containing the components in all proportions, and values for the maximum molecular conductivities have been deduced. The curves representing the dependence of μ_∞ on the composition of the solvent show a minimum when the solvent contains 70—80 per cent. by volume of alcohol. From the values of μ_∞ and the transport numbers (calculated from that of iodine in potassium iodide and sodium in sodium chloride), the migration velocities of the ions in the various aqueous alcoholic solutions are calculated:

Migration Velocities (18°).

Vol. per cent. EtOH.	I′.	K′.	Cl′.	Na′.	H′.	$OH·C_6H_4·CO_2'$.	$CN·CH_3·CO_2'$.
0	66·7	65·3	65·9	44·4	318·0	—	—
20	37·9	36·5	38·2	27·1	188·7	17·5	21·3
40	24·6	23·6	26·2	19·2	120·1	12·9	15·8
60	20·7	19·8	20·1	15·2	75·9	11·3	14·0
80	19·1	18·4	17·1	14·0	50·2	11·3	14·0
100	27·5?	21·5	23·8	14·5	32·1	12·6	15·0

These data have been utilised for the purpose of deducing the dissociation of salicylic, cyanoacetic, and bromoacetic acids in aqueous alcoholic solutions. The three acids are found to satisfy the dilution law, whatever the composition of the alcohol water mixture. The dissociation constants $k.10^5$ are:

Vol. per cent. EtOH	0.	20.	40.	60.	80.	100.
Salicylic	100	83	32	11	1·8	0·013
Cyanoacetic	370	210	120	57·3	10·7	0·05
Bromoacetic	138	85	35	10·2	1·7	0·015

The values of *k* decrease with increase in the proportion of alcohol, slowly at first, then more rapidly, until the values for pure alcohol are only about 1/30th of those for 90 per cent. alcohol.

The molecular conductivity of acetic acid in amyl alcohol passes through a minimum value at a concentration of approximately 0·5 mol. per litre. This peculiarity cannot be explained by a change in the dielectric constant. H. M. D.

Ionisation of Chromophores. Herman Decker (*Ber.*, 1904, **37**, 2938—2941. Compare Abstr., 1891, 1247; Gadomska and Decker, Abstr., 1903, i, 692).—Quinquevalent nitrogen and quadrivalent oxygen and sulphur, when forming part of an aromatic ring, form chromophoric groups with bromine or iodine. Thus pyridinium and quinolinium methiodides are strongly coloured. When dissociation takes place in solution, the colour disappears, the chlorine and bromine ions being colourless. Thus 6 : 8-dinitroquinolinium methiodide forms blackish-red needles, but dissolves in water to a colourless solution. The degree of dissociation may in many cases be followed colorimetrically. The chromophoric properties of the acridinium, xanthonium, and thioxanthonium compounds are very strongly marked. In these cases, the dark-coloured bromides and iodides form yellow or orange solutions, the organic ion being itself coloured. C. H. D.

Magnetisation of the Alkali Metals. Arciero Bernini (*Nuovo Cimento*, 1904, [v], 7, 441—447).—By means of a modified torsion balance similar to that used by Curie and Chénevau (*J. Phys.*, 1903, **2**), the author has measured the coefficients of magnetisation of sodium, potassium, and lithium. The values obtained are respectively: $0·5438.10^{-6}$, $0·632.10^{-6}$, and $0·3836.10^{-5}$. These coefficients diminish with temperature and do not undergo a sudden change with a change of state. The values given show that the alkali metals are paramagnetic and not diamagnetic as supposed by Faraday. W. A. D.

Specific Heat of Superheated Steam. H. Lorenz (*Chem. Centr.*, 1904, ii, 393—394; from *Physikal. Zeit.*, **5**, 383—385).—The specific heat of steam between 205° and 340° has been determined by means of a calorimeter through which the steam was passed. Only half the Joule-Thomson effect was taken into account in the calculation of the constant. The results may be approximately represented by the formula $cp = 0·43 + 3{,}600{,}000\ p/T^3$, in which p is the mean pressure of the steam and T its mean absolute temperature. The formula allows of extrapolation to + 172°, and at this temperature gives a value = 0·47; Regnault found by experiment 0·48. E. W. W.

Heat of Neutralisation of Some Pseudo-acids (*iso*Nitroso-compounds). Paul Th. Muller and Ed. Bauer (*J. Chim. Phys.*, 1904, **2**, 457—471).—The authors have determined the heats of neutralisation of *iso*nitrosocyanoacetic acid and its methyl and ethyl derivatives as well as of ethyl *iso*nitrosoacetoacetate. The results indicate that in the free acid the carboxylic group functionates as a true acid, but that the *iso*nitroso-groups possess a negative heat of dissociation of about 4 cals., which is a characteristic property of the pseudo-acid groups. L. M. J.

Determination of the Heat of Dissociation of Some *iso*Nitroso-acids (Pseudo-acids) by the Conductivity Method. Paul Th. Muller and Ed. Bauer (*J. Chim. Phys.*, 1902, 2, 472—497).—The dissociation constant can be calculated from the conductivity of a salt or acid, and from the temperature coefficient of this constant the heat of dissociation is readily calculated by the well known Van't Hoff expression. The authors have in this way determined the heats of dissociation of the acids investigated previously (preceding abstract), and it was found that the results thus obtained are in good accord with those obtained from the heats of neutralisation. L. M. J.

Pyrogenic Reactions and Dissociation. Walther Löb (*Zeit. Elektrochem.*, 1904, 10, 504—508).—From his previous experiments (Abstr., 1903, i, 20, 29, 806) the author draws the conclusion that the pyrogenic reactions are most readily understood by assuming that the substances first dissociate and that the products then recombine. He then proceeds to extend this view of chemical change to all reactions, and particularly to the conversion of optical isomerides into each other. Electrolytic dissociation is regarded as a special case of the general dissociation postulated, distinguished by the combination of the products of dissociation with electrons, whereby the reactivity of the products is diminished to such an extent that they can exist in finite concentrations.

The products of dissociation are regarded as compounds in which the valency of the element in question is less than its maximum value. The valency of an element is a function of the experimental conditions. T. E.

Vapour Pressure of Mercury at Ordinary Temperatures. Edward W. Morley (*Zeit. physikal. Chem.*, 1904, 49, 95—100).—A current of a dry indifferent gas, such as carbon dioxide, was saturated with mercury vapour by passing it for about 14 days through a weighed quantity of the metal contained in an absorption vessel, and the vapour pressure was then calculated from the volume of the gas and the loss of weight of the absorption apparatus. The values of the vapour pressure thus obtained are shown below:

Temperature.	Vapour pressure in mm.
16°	0·0010
30	0·0027
40	0·0052
50	0·0113
60	0·0214
70	0·0404

These values are in good agreement with those given by the formula $p = ab^t$, in which log $a = 4·6064$ and log $b = 0·02856$. J. C. P.

A Differential "Araeopicnometer." H. Rebenstorff (*Chem. Zeit.*, 1904, 28, 889—890).—A combination of a hydrometer and a specific gravity bottle. When filled with the liquid to be tested and placed in water at 15°, the specific gravity may be at once read off on the stem, which is graduated from 1·9 to 2. When the sp. gr. is lower than 1·9, weights are suspended from the bottom of the apparatus until a reading becomes possible and the amount is deducted from the figure on the stem. L. de K.

Significance of Changing Atomic Volume. IV. Effects of Chemical and Cohesive Internal Pressure. Theodore W. Richards (*Zeit. physikal. Chem.*, 1904, 49, 15—40. Compare Abstr., 1902, ii, 305; 1903, ii, 132).—The author's conclusions, based partly on some fresh experimental data (see Richards and Stull, this vol., ii, 384), are summarised as follows: Among compounds of lithium, sodium, potassium, chlorine, bromine, and iodine, the compound of a more compressible element is invariably formed with a greater decrease of volume than the compound of a less compressible element, other conditions being equal. Available data for silver chloride, zinc and cadmium chlorides and bromides, and carbon disulphide show that the more volatile the substance (that is, the slighter its cohesive attraction) the greater is the molecular volume, other conditions being equal. A given change in chemical energy produces a smaller change of volume than does the same change of cohesive energy. These facts are explained by the assumption that both chemical energy and cohesive energy exert a compressing effect on a solid or liquid substance, and that the chemically tied part of each atom is more compressed than that which is subject only to cohesive pressure. Polymerisation and crystallisation may cause irregularities, but in the cases of water and tin, which are discussed in detail, there is nothing contradictory to the above explanation. The explanation covers also the relations of density, compressibility, and boiling point exhibited by many isomeric organic compounds. Thus is shown the reason why additive molecular volumes are obtained only when, of two liquids, the less volatile (that is, the more cohesive) is heated to a higher temperature. These varying intensities of internal pressure are regarded as capable of explaining the variety of physical properties, such as tenacity and malleability. The foregoing considerations are regarded as affording increased evidence as to the significance of changing atomic volume, and increased support for the theory of compressible atoms.
J. C. P.

Determination of the Surface Tension and Molecular Weight of Liquid Nitrous Oxide. Leo Grunmach (*Sitzungsber. k. Akad. Wiss. Berlin*, 1904, 1198—1202).—The surface tension of liquid nitrous oxide was determined by the capillary wave method previously used for liquid air (Abstr., 1901, ii, 646). The value obtained at 89·3° was 26·323 dynes/cm. The critical temperature of nitrous oxide is 36·4° (Cailletet and Mathias) or 35·4° (Dewar). The values for the molecular weight calculated from these temperatures and from the surface tension are respectively 43·26 and 43·78, so that the compound has the same molecular weight in the liquid and gaseous states. L. M. J.

Surface Tension Effects in Beer and in connection with the Preparation of Beer. Fritz Emslander and Herbert Freundlich (*Zeit. physikal. Chem.*, 1904, **49**, 317—328).—Electrical convection experiments show that beer contains a positive colloid. The colouring matter of beer is largely colloidal in nature, for it also travels to the cathode and is deposited there along with the other colloids. The greater or less permanence of beer froth is connected with its content of colloidal substances (compare Zawidzki, Abstr., 1903, ii, 281; Benson, *ibid.*, 715; Ramsden, this vol., ii, 323). The excess of carbon dioxide held in solution by beer is attributed to absorption by the dissolved colloids, for it has been shown that positive colloids absorb acids. Heat is developed when colloids absorb water and "swell," and the heat given out at many stages in the brewing process is probably due to a similar "swelling." The authors discuss also the bearing of different vessel surfaces on the stability of a super-saturated gas solution. J. C. P.

Liquefaction of Gaseous Mixtures. F. Caubet (*Zeit. physikal. Chem.*, 1904, **49**, 101—116. Compare Abstr., 1902, ii, 382).—The behaviour of mixtures of carbon dioxide and nitrous oxide has been studied in the manner previously described. The results obtained are somewhat complex and do not lend themselves to abstraction.

J. C. P.

The Most Probable Value of the Gas Constant R. Daniel Berthelot (*Zeit. Elektrochem.*, 1904, **10**, 621—629).—The value of R in the equation $pv = RT$ can be obtained from observations on real gases if p is taken small enough. For the permanent gases, the curves representing pv as a function of p (at constant temperature) are straight lines up to 5 or 6 atmospheres. It is therefore possible to calculate the value of pv for $p = O$ with great accuracy. The data required are the molecular weight of the gas, the weight of a litre of the gas under standard conditions, and the compressibility of the gas between 0 and 1 atmosphere. From the results obtained for seven gases by Leduc and Sacerdote, and using the atomic weights of the International Commission, the volume occupied by 1 mol. of a perfect gas under standard conditions is found to be 22·4135 litres, and, using Lord Rayleigh's measurements on three gases, 22·4098. A rather better agreement is obtained when the more accurate atomic weights H = 1·0076 and C = 12·004 are used, the numbers becoming 22·4130 and 22·4116 respectively.

Gases containing nitrogen give considerably higher values when Stas' atomic weight (14·04) is used, but taking N = 14·005, the normal value is found. The author considers that the atomic weight 14·04 is certainly too high. In order to calculate the value of R, the melting point of ice on the absolute scale is required. From Joule and Thomson's results, combined with the accurate measurements of the coefficients of expansion of hydrogen, air, and carbon dioxide made by Chappuis, the mean value $T_0 = 273 \cdot 10$ is obtained. From Chappuis' measurements of the coefficients of expansion and of compressibility of nitrogen and of hydrogen the value 273·08 is calculated. The mean of these two numbers is taken and leads to the final value, $R = 22 \cdot 412/273 \cdot 09 = 0 \cdot 08207$, the units being the atmosphere and litre.

The uncertainty of this number is about one unit in the last place.

T. E.

Numerical Values of Some Important Physicochemical Constants. Walther Nernst (*Zeit. Elektrochem.*, 1904, **10**, 629—630).—Using the values found by Berthelot in the preceding abstract, the following values are calculated and offered for criticism: $R = 0 \cdot 83155 \times 10^8$ [Erg. T^{-1}] or $R = 1 \cdot 98507$ [gram calories T^{-1}]. The latter value is calculated taking the mechanical equivalent of heat as $41 \cdot 89 \times 10^6$ Erg. for the 15° gram calorie. Since 1 watt $= 0 \cdot 23872$ gram cal., $R = 0 \cdot 86134 . 10^{-4}$[Watt].

Finally, the molecular weight of an ideal gas is $28 \cdot 979\Delta$, where Δ is its density referred to air as unity.

T. E.

More Exact Equation of Condition for Gases. II. J. B. Goebel (*Zeit. physikal. Chem.*, 1904, **49**, 129—161).—A more detailed mathematical study of the assumptions underlying the equation previously deduced (this vol., ii, 311).

J. C. P.

An Application of Cailletet and Mathias' Method for the Determination of the Critical Volume. Miecyslaw Centnerszwer (*Zeit. physikal. Chem.*, 1904, **49**, 199—207).—Tubes of equal dimensions are filled to different degrees with the liquid under investigation, and after expulsion of air are sealed off. When the ratio of the weight of liquid to the volume of the tube is less than the critical density, the liquid disappears at a certain temperature which can be easily determined, and at this point the mean density of the contents of the tube is the density of the saturated vapour. When the above ratio is greater than the critical density, the vapour will disappear at a certain temperature, and the mean density of the contents of the tube at that point is the density of the liquid under the pressure of its own vapour. From a number of points determined in this way, the density-temperature curve can be constructed and an application of the law of the rectilinear diameter gives the critical volume. In order to test the method, the following critical constants have been determined:

	Crit. temp.	Crit. dens.
Methyl chloride	143·0°	0·370
Ether	194·4	0·258
Methyl alcohol	240·2	0·275

J. C. P.

The Tonometric and Cryoscopic Formulæ. E. ARIÈS (*Compt. rend.*, 1904, **139**, 462—464).—From the expression $h_0 = H_0 - x_1RT$, where h_0 and H_0 represent the potential of the dissolved substance and the solvent respectively and x_1 represents the molecular proportion of the substance dissolved in the molecular weight of the solvent (compare this vol., ii, 648), the author deduces the formulæ used in tonometry and cryoscopy. M. A. W.

A Theory of Solutions. ISIDOR TRAUBE (*Phil. Mag.*, 1904, [vi], **8**, 158—165).—The author urges various objections to the accepted theory of solutions; the most important of these are the failure of theory to interpret the case of strong solutions and the discrepancies obtained for non-aqueous solutions. The calculation of the dissociation coefficient may be allowed, but the interpretation of it rejected. An endeavour is made to combine with Arrhenius's theory some of the earlier assumptions of Clausius; this is done by assuming that the molecule or ion of the solute is combined with a molecule of the solvent, and in the state of a dynamic equilibrium, that is, wandering from one molecule to another. It has been shown that the fundamental osmotic laws may be explained by these considerations (Poynting, *Phil. Mag.*, 1896, **42**, 289). They also afford an explanation of the influence of association of the solvent on the dissociation of the solute, as it may be assumed that the molecules or ions of the latter are able to dissociate the associated molecules of the solvent and to join with them. In order to obtain definite support for these considerations, the author shows that the well-known equation of Rudolphi and van't Hoff, applicable to strong electrolytes, may be deduced from them (Abstr., 1903, ii, 63). L. M. J.

Critical Point of Dilute Saline Solutions. LEONE LEVI-BIANCHINI (*Atti R. Accad. Lincei*, 1904, [v], **13**, ii, 174—176).—The author has investigated the critical phenomena of saline solutions, in which the dissolved substance has a negligible vapour pressure, while the ionisation is virtually zero (Walden and Centnerszwer, Abstr., 1902, ii, 245).

With dilute solutions of lithium chloride, bromide, and iodide, and of sodium and potassium bromides and iodides in methyl alcohol, there is perfect homogeneity at the critical temperature and beyond it; the critical temperature is raised proportionately to the concentration. With the chlorides of sodium, potassium, and strontium, the solubility vanishes below the critical temperature of the alcohol. Barium and calcium chlorides seem to undergo alteration and exhibit complex phenomena which recall that of the retrograde condensation of liquid mixtures. Zinc, cadmium, and ferrous chlorides and potassium thiocyanate also decompose, these salts being capable of bringing about various reactions with organic substances. Cobalt chloride remains dissolved in the compressed vapour of the alcohol above the critical temperature, but a gradual decomposition of the chloride takes place with formation of a white, insoluble deposit; on making repeated experiments with the same tube, it is found that the solution becomes almost colourless, while the critical temperature falls to approximately that of the pure solvent. The cobalt chloride solution gives a colourless vapour over the blue solution at temperatures below the critical point, but when the latter is reached, the whole contents of the tube become homogeneous and blue. T. H. P.

Fluidity and Conductivity of Some Concentrated Aqueous Salt Solutions below 0°. Willy Hechler (*Ann. Physik*, 1904, [iv], 15, 157—173. Compare Lyle and Hosking, Abstr., 1902, ii, 440; Bousfield and Lowry, Abstr., 1903, ii, 52; Kohlrausch, *ibid.*, 403).—Solutions of sodium chloride and iodide, potassium thiocyanate and acetate, calcium chloride, mixed solutions of potassium nitrate and ammonium thiocyanate, and of ammonium nitrate and potassium thiocyanate have been investigated. The convergence points obtained by extrapolation from the conductivity curves are close together in the majority of cases, namely, at −64° to −71°. These, however, do not agree very well with the convergence points obtained by extrapolation from the fluidity curves. J. C. P.

Comparative Solubility of Gases, &c., in Water and in Aqueous Solutions. Gustav Geffcken (*Zeit. physikal. Chem.*, 1904, 49, 257—302).—The solubilities of hydrogen, oxygen, carbon dioxide, and nitrous oxide in water have been determined at 15° and 25°, and are found to have the following values:

	Hydrogen.	Oxygen.	Carbon dioxide.	Nitrous oxide.
15°.........	0·01982	0·03630	1·070	0·7784
25°.........	0·01926	0·03080	0·8255	0·5942

The solubilities of these gases in solutions of acids, bases, and salts of various concentrations have also been determined. The relative equivalent depression of the solubility has been calculated from the data for each case and is found to be greater at 15° than at 25°. Of nitric, hydrochloric, and sulphuric acids, the first has the least and the last has the greatest influence in lowering the solubility of the above four gases. Indeed, the solubilities of carbon dioxide and nitrous oxide are increased in nitric acid solutions. Both with hydrogen and oxygen, sodium hydroxide lowers the solubility to a greater extent than potassium hydroxide. The order of the salts arranged according to their influence is nearly the same for different gases, and pretty much what has been deduced in other investigations (compare Rothmund, Abstr., 1900, ii, 467; Biltz, Abstr., 1903, ii, 358); here also there are indications of additive relationships. The magnitude of the relative depression of the solubility depends, however, on the nature of the gas, and differs, it is observed, for the otherwise similar gases, carbon dioxide and nitrous oxide; the latter, in fact, behaves in water as an indifferent gas. The power of water to dissolve gases is practically unaffected by the presence of colloids such as ferric hydroxide and arsenic trisulphide.

Electrolytes, when dissolved in water, produce a change in the internal pressure, and this change is very probably connected with the influence they exert on the solubility of gases. To a similar cause may be referred the deviations from the mass action law exhibited by electrolytes, so far as these are connected with the extent to which the solubility of one electrolyte is influenced by the presence of another. The latter point is illustrated in the paper by a study (1) of the solubility of thallium chloride as increased by ammonium, potassium, sodium, and lithium nitrates, and potassium and sodium chlorates; (2) of the solubility of potassium bromate as increased by sodium nitrate and chloride. The relative influence here of nitrate, chlorate, and chloride is very similar to what it is when the other dissolved substance is a gas or a non-electrolyte. J. C. P.

Determinations of Solubility in Mixtures of Solvents. I. WALTER HERZ and M. KNOCH (*Zeit. anorg. Chem.*, 1904, 41, 315—324).—The authors have determined the solubility of various substances in mixtures of acetone and water.

Acetone, prepared from its sodium hydrogen sulphite compound, remains practically unacted on at the ordinary temperature in contact with potassium permanganate for 24 hours. Determinations of the solubility of potassium permanganate in aqueous acetone of varying concentrations were made at 13°. The solubility rises to a maximum with increase of the amount of acetone and then sinks, the maximum being attained in a mixture containing 3 parts of water to 7 of acetone. The solubility of potassium permanganate in pure acetone is less than in pure water.

The solubility of potassium chloride at 20° sinks as the concentration of acetone increases, and in pure acetone is so slight that it could not be determined. The solubility of sodium chloride is similar except that in this case, with increase of acetone, two layers were formed.

Mercuric chloride appears to form compounds with acetone when the latter is in excess.

The solubility of boric acid at 20° rises to a maximum and then sinks. The solubility of boric acid in pure acetone is slight.

The solubility of succinic acid at 20° rises to a maximum corresponding with a concentration of 3 parts of water to 7 of acetone.

The solubility of barium hydroxide at 25° diminishes very rapidly with increasing concentration of acetone.

With sucrose, two layers separated at the concentration of 55 parts of water to 45 of acetone. The constant, deduced from the values at 25°, was calculated from Bodländer's formula, $W/\sqrt[3]{S}=K$, where W represents the number of grams of water and S the number of grams of dissolved substance in 100 c.c. of solution. A. McK.

Reciprocal Solubility of Oil of Turpentine and Aqueous Alcohol. MAURICE VÉZES and MOULINE (*Bull. Soc. chim.*, 1904, [iii], 31, 1043—1049).—Oil of turpentine is miscible with alcohol through a wide range of temperature, but this range becomes greatly restricted when the oil is dissolved in mixtures of alcohol and water. For each mixture of oil, alcohol, and water, separation into two layers occurs at a definite temperature, which varies with the pressure. The "curves of separation" obtained by plotting values of the mass of aqueous alcohol (z), in unit mass of each of a series of mixtures, as ordinates, and the temperatures of separation, for the same mixtures, as abscissæ, are of the type usually found for binary mixtures (Rothmund, Abstr., 1898, ii, 503), the temperature of separation rising to a maximum and then decreasing as the concentration of alcohol is increased. The curves are not symmetrical, but as a whole lie nearer to the terminal line $z = 0$ (turpentine oil) than to $z = 1$ (aqueous alcohol) (compare Alexéeff, Abstr., 1886, 847, and Rothmund, *loc. cit.*). Data for alcohols containing respectively 2 and 5 per cent. of water are given in the original. From the nature of these curves, it is shown that (1) the temperature of separation rises as the concentration of water, relative to alcohol, is increased, (2) the solubility of aqueous alcohol in turpentine oil is much less than that of the oil in the aqueous alcohol at the same temperature, and (3) the method of identifying fats by means of their critical solution temperatures (Crismer, Abstr., 1896, ii, 506, and 1903, ii, 10) cannot be generally applicable, since this constant is not practically independent of the concentration as Crismer supposed.

By observing the temperatures of separation for mixtures of oil and alcohol in which the concentration of alcohol in the water-alcohol mixture used varies, a series of isothermal curves of separation was constructed in which the strengths (y) of the alcohols are abscissæ and the masses of aqueous alcohol (z) in the ternary mixtures are ordinates. These curves are similar in form to the foregoing.

T. A. H.

Hydrates in Aqueous Solution. Wilhelm Biltz (*Ber.*, 1904, 37, 3036—3042).—Polemical. A criticism of the theory put forward by Jones (this vol., ii, 386) that the abnormalities in the freezing point of aqueous solutions of electrolytes are due to the formation of hydrates in concentrated solutions, whereas such hydrates do not exist in more dilute solutions.

E. F. A.

Presence of Hydrates in Concentrated Aqueous Solutions of Electrolytes. Harry C. Jones and Frederick H. Getman (*Zeit. physikal. Chem.*, 1904, 49, 385—455).—In continuation of previous work (this vol., ii, 386), the authors have determined the freezing points, conductivities, refractive indices, and specific gravities for a large number of concentrated salt solutions. The salts investigated are chiefly the haloids and nitrates of lithium, sodium, potassium, calcium, strontium, barium, magnesium, zinc, cadmium, aluminium, chromium, and iron. The results obtained give further support to the theory previously advanced. From the fact that the most favourable concentration for the formation of hydrates is 0·2—0·3 normal, the authors conclude that the ions also have the power of associating themselves with water molecules.

J. C. P.

Existence of Hydrates in Solutions of Certain Non-electrolytes and the Non-existence of Hydrates in Solutions of Organic Acids. Harry C. Jones and Frederick H. Getman (*Amer. Chem. J.*, 1904, 32, 308—338. Compare Abstr., this vol., ii, 386).—The freezing points and sp. gr. of solutions of different concentrations of methyl alcohol, ethyl alcohol, *n*-propyl alcohol, acetone, acetamide, carbamide, chloral hydrate, glycerol, dextrose, lævulose, mannitol, lactose, and sucrose have been determined, and from the data obtained the extent to which hydrates are formed in each solution has been calculated.

Glycerol is the only one of these non-electrolytes which shows any very marked tendency to form hydrates; the complexity of the hydrate increases regularly from the most dilute to the most concentrated solution investigated. Sucrose and lævulose also show considerable hydration, but to a much smaller extent than glycerol. Methyl and ethyl alcohols exhibit a slight power of combining with water in solution. A number of these non-electrolytes, especially propyl alcohol, acetone, carbamide, and lactose, show a tendency to undergo polymerisation in presence of water, and, in such cases, it is impossible to ascertain the extent to which hydration takes place. Acetamide appears neither to form hydrates nor to undergo polymerisation at any dilution. Chloral hydrate, dextrose, and mannitol show very slight hydration.

The freezing points, sp. gr., and conductivity of solutions of acetic, oxalic, succinic, tartaric, and citric acids have been determined. It is found that these acids do not undergo hydration to an appreciable extent. Acetic, oxalic, and succinic acids show a tendency to undergo polymerisation in solution, whilst tartaric and citric acids undergo neither polymerisation nor hydration.

The results of this investigation are tabulated, and the freezing points and conductivity measurements are plotted as curves. E. G.

Existence of Alcoholates in Solutions of Certain Electrolytes in Alcohol. HARRY C. JONES and FREDERICK H. GETMAN (*Amer. Chem. J.*, 1904, 32, 338—342).—A study of the results obtained in some determinations of the elevation of the boiling point of ethyl alcohol produced by certain electrolytes (this vol., ii, 386) has led to the conclusion that, in the cases of sodium bromide and the iodides of cadmium, potassium, ammonium, and sodium, the dissolved salt unites to some extent with the solvent.

In order to obtain further evidence on this point, the molecular rise of boiling point produced by lithium chloride, lithium nitrate, and calcium nitrate has been determined. The results are tabulated and also plotted as curves. It is shown that the molecular elevation in the boiling point of ethyl alcohol, produced by lithium chloride and nitrate, is greater than the value calculated from their dissociation; the same is true for calcium nitrate, but only in dilute solutions. These results are explained as being due to the formation of alcoholates. A certain proportion of the alcohol being thus removed from the sphere of action, there is less acting as solvent, and the rise in the boiling point is consequently greater than would be expected from the amount of dissolved substance present. E. G.

Solid Solutions between Organic Compounds. FELICE GARELLI and FELICE GORNI (*Gazzetta*, 1904, 34, ii, 101—113).—Phenyl salicylate (salol) is a troublesome solvent for cryoscopic measurements, but if the external bath is kept at about 3° below the freezing point of solution so as to obtain superfusion to the extent of about 2°, and if also care is taken in the stirring, concordant results can be obtained.

From measurements of solutions of naphthalene, azobenzene, bromobenzene, diphenyl, *p*-xylene, benzanilide, acetanilide, and benzoic acid in phenyl salicylate, the molecular freezing point depression for this solvent is found to be about $K = 123$.

Phenyl benzoate and salicylresorcinol give abnormally small depressions in phenyl salicylate solutions, whilst salicylquinol raises the freezing point even in very low concentrations. Salicylanilide also forms solid solutions with phenyl salicylate, showing that the groups ·O· and ·NH· in open chains are isomorphogenic.

Measurements of the freezing points of solutions of naphthalene and diphenyl in phenyl benzoate give the value 80 for the molecular freezing point depression of this solvent. In concentrations greater than 1 per cent., acetanilide gives abnormal molecular weights in phenyl benzoate. Benzanilide also gives solid solutions with phenyl benzoate, confirming the isomorphogenic relations of the groups ·O· and ·NH· in open chains. Salol yields abnormally small depressions in phenyl benzoate solution.

Antimony tribromide forms solid solutions with bromoform, showing that Sb, like N, is isomorphogenetic with CH. T. H. P.

Solid Solutions. Giuseppe Bruni and A. Trovanelli (*Atti R. Accad. Lincei*, 1904, [v], **13**, ii, 176—184).—The authors have made a series of experiments to ascertain whether oxy-compounds form solid solutions with the corresponding sulphur compounds.

Thioacetic acid gives abnormal molecular weights (99—105 instead of 76) in freezing acetic acid. Thioacetamide yields normal values in acetamide and formamide solutions. Ethyl thiolcarbamate gives abnormal values (182—185 instead of 105) and ethyl thioncarbamate normal values in freezing urethane.

Hence, in the aliphatic series, compounds containing the group ⋮C·SH (thioacetic acid and ethyl thiolcarbamate) give solid solutions with the corresponding derivatives containing the group ⋮C·OH, while the sulphur compounds, containing the residue :C:S (thioacetamide and thioncarbamate), are incapable of crystallising with the corresponding oxygen derivatives.

Thiophenol, however, has the normal molecular weight in freezing phenol, so that the law given above for aliphatic compounds cannot be extended to aromatic derivatives.

p-Chloronitrobenzene exhibits abnormal cryoscopic behaviour in *p*-fluoronitrobenzene, but the abnormality is much less marked when the latter is dissolved in the former. This agrees with previous observations and also with theoretical considerations, which show that, when two isomorphous substances differ markedly in their melting points, the abnormality in molecular weight is the greater when the one with the high melting point is dissolved in the other.

Contrary to the statement of Castoro (Abstr., 1899, ii, 360), acetamide is a good solvent for cryoscopic determinations. T. H. P.

Molecular State of Anhydrous and Hydrated Salts of Metals in Organic Solvents. Giuseppe Bruni and A. Manuelli (*Zeit. Elektrochem.*, 1904, 10, 601—604).—The depression of the freezing point of urethane and of acetamide produced by copper, nickel, cobalt, and manganese chlorides is determined.

In urethane, the anhydrous salts and water separately give normal freezing point depressions, whereas the two together give small depressions. The results lead to the conclusion that a portion of the water of crystallisation of these salts remains in combination with them when they are dissolved in urethane. When dissolved in acetamide, the anhydrous salts are dissociated to a large extent. When water is added to the solution of the anhydrous salt, it produces the same depression of the freezing point which would be observed with the pure solvent. Except copper chloride, the hydrated salts behave as though the whole of the water was split off. Copper chloride appears to retain $\frac{1}{2}H_2O$. The decomposition may be due to the high temperature (82°) or to the combination of the salts with acetamide itself. T. E.

Order of Magnitude of the Time of Formation of Complex Molecules, Equilibrium Constants, and Atomic Dimensions. Guido Bodländer (*Zeit. Elektrochem.*, 1904, 10, 604—607).—Referring to Haber's paper on this subject (this vol., ii, 607), the author suggests that the active mass of a dissolved substance is not necessarily proportional to its concentration, and that the extremely small active masses calculated from *E.M.F.*s may correspond with much larger concentrations. There are no grounds for doubting the reality of the small active masses calculated; in some cases (for example, a solution of silver chloride in an alkali chloride) they may be shown analytically to exist. The difficulty which Haber sees in the rapid chemical reactions which occur in solutions containing complex ions may be avoided by supposing that the complex ions react directly and do not first dissociate into simple metallic ions. For example, the precipitation of silver sulphide from a solution of potassium silver cyanide may take place as follows: $2Ag(CN)_3'' + S'' \rightleftarrows Ag_2(CN)_6S''''''$ and $Ag_2(CN)_6S'''''' = Ag_2S + 6CN'$. This would be analogous to the decomposition of silver potassium thiosulphate. The electrolytic deposition of silver from such a solution might occur by the $Ag(CN)_3''$ ion first taking up a negative charge at the cathode, forming the unstable ion $Ag(CN)_3'''$, which would then decompose into Ag and $3(CN)'$.

Richard Abegg (*ibid.*, 607—609) considers that the fact that an electrode is very much more completely and rapidly depolarised by a solution containing a complex salt of a metal than by a dilute solution of a salt of the same metal containing the same number of metallic ions proves that the metallic ions are formed from the complex ions with great velocity. The observations of Brereton Baker on the effects of minute quantities of water on chemical reactions are cited as showing that very small quantities of ions are capable of producing rapid reactions. The author also takes the view that many organic reactions are due to quantities of ions which are much smaller than even the smallest calculated in solutions of inorganic substances.

H. Danneel (*ibid.*, 609—610) holds that the shortest time in which a chemical change can take place is not necessarily so long as that calculated by Haber. If the reacting molecules are in contact, it may be infinitely small. T. E.

Diminution in the Velocity of Crystallisation caused by Foreign Substances. Maurice Padoa and D. Galeati (*Atti R. Accad. Lincei*, 1904, [v], 13, ii, 107—111. Compare Dreyer, Abstr., this vol., ii, 611).—The authors criticise the calculations and results of von Pickardt (Abstr., 1903, ii, 66). They have measured the velocities of crystallisation of α-naphthylamine, diphenylamine, benzil, and benzophenone, both in the pure state and when mixed with varying proportions of various substances of widely-differing molecular weights. The maximum velocity was taken as the observed value, and not an extrapolated value as was done by von Pickardt. The results with benzophenone correspond with those obtained by von Pickardt and do not obey the laws laid down by this author, to the effect that molecular quantities of dissolved substances lower the velocity of crystallisation of the solvent to the same extent and that this lowering is proportional to the square root of the concentration of the solute. Cryoscopic measurements show that the substances dissolved in benzophenone possess normal molecular weights. Liquids have a greater influence on the velocity of crystallisation than solids.

The phenomena of crystallisation are very complex and probably depend on the internal friction of the melted mass. T. H. P.

Proof of the Nature of Liquid Crystals by Aid of Electric Kataphoresis. Georg Bredig and G. von Schukowsky (*Ber.*, 1904, 37, 3419—3425. Compare Tammann, Abstr., 1902, ii, 445; Rotarski, Abstr., 1903, i, 869; Schenk and Eichwald, this vol., i, 118; de Kock, this vol., ii, 548).—If a current of electricity, at a potential varying from 72 to 20,000 volts, is passed through a suspension of shellac in water, the shellac particles immediately gather at the anode and in 5 minutes the separation is distinct to the unaided eye. Under the microscope, with an *E.M.F.* of 70 volts, the separation can be observed almost instantaneously.

If the so-called liquid crystals are really emulsions, separation should take place in this manner. With the liquid crystals of *p*-azoxyanisole, anisaldazine, the condensation product of benzaldehyde and benzidine, and the condensation product of *p*-tolualdehyde and benzidine, no such separation took place when a current, at potentials varying from 72 to 48,000 volts, was passed through them for 10 minutes to 3 hours. With cholesterol propionate, in three experiments at an *E.M.F.* of 72 volts, the current passing for 60—100 minutes, the liquid at the cathode appeared to become clearer, but no change took place on reversing the current. G. Y.

New Points in the Theory of Colloids. Eduard Jordis (*Zeit. Elektrochem.*, 1904, 10, 509—518).—With the exception of silver, all inorganic colloids are formed from elements of valency higher than unity. The salts of all these elements are hydrolysed in aqueous solution. The formation of the colloid is regarded as the final result of the continued hydrolysis. The pure hydroxides never form hydrosols; when the content of acid or alkali is reduced below a certain point, the colloid invariably separates as a hydrogel. Even in Bredig's metallic colloid solutions, the author thinks that a sufficient quantity of alkali or other impurity would be present to form a hydrosol. The small quantity of acid or alkali required to form a hydrosol is supposed to be combined with the colloid in the form of an ion, so that the colloid has an electric charge; this charge changes its surface tension: as long as the surface tension is the same as that of the liquid, the colloid remains in the hydrosol form; having the same surface tension as the liquid, it is indistinguishable from it, but is nevertheless merely a suspended solid. The formation of the hydrogel is due to the charge changing, and with it the surface tension.

T. E.

Stability of the Equilibrium of Multivariant Systems. PAUL SAUREL (*J. Physical Chem.*, 1904, **8**, 488—490).—An extension of the theorems deduced concerning the stability of a bivariant system (this vol., ii, 643). The theorems are obtained by replacing "trivariant" and "bivariant" for "bivariant" and "univariant" in the previous paper. The theorems may be further extended to any multivariant systems.

L. M. J.

Indifferent Points. PAUL SAUREL (*J. Physical Chem.*, 1904, **8**, 491—492).—A multivariant system is at an indifferent point when it admits of a series of equilibrium states during which temperature, pressure, and concentrations remain constant while the masses of the phases change. The temperature of the indifferent point is, in general, a maximum or a minimum of the temperatures at which the system is in equilibrium under the given pressure, and the pressure similarly a maximum or a minimum for the given temperature. If for a reversible change the changes of entropy and volume have the same sign, the maximum pressure is associated with a minimum temperature and a minimum pressure with a maximum temperature. If, however, the changes of entropy and volume have different signs, then maxima (or minima) of pressure and temperature are associated.

L. M. J.

Equilibrium between Silver Salts. RICHARD LUCAS (*Zeit. anorg. Chem.*, 1904, **41**, 193—215).—When potassium chloride is agitated with silver cyanide, the complex potassium silver cyanide is formed and silver chloride separates. This reaction proceeds almost instantaneously. When potassium silver cyanide is agitated with silver chloride, potassium chloride is formed and silver cyanide separates. In the reaction $Ag{\cdot}Ag(CN)_2 + KCl \rightleftarrows K{\cdot}Ag(CN)_2 + AgCl$, silver chloride and silver cyanide separate as solid phases; their active masses are accordingly constant and the following relationships exist: $[Ag^{\cdot}]^{\cdot}[Ag(CN)_2{}'] = K_1$ and $[Ag^{\cdot}][Cl'] = K_2$, where K_1 and K_2 represent the solubility products of the solid phases. Equilibrium is established when $[Ag(CN)_2{}']/[Cl'] = K_1/K_2 = \text{constant}, K$. The latter value was found by experiment to be 0·0260 at 25°; it remains the same whether equilibrium is established between silver cyanide and potassium chloride or between potassium silver cyanide and silver chloride. When the solubility product of one of the sparingly soluble salts is known, the value for the other is readily determined. Thus the solubility product of silver chloride at 25° is $(1·41 \times 10^{-5})$, whence that for silver cyanide is $0·0260\ (1·41 \times 10^{-5}]^2$, whilst the solubility is $2\ 27 \times 10^{-6}$. When the solubility of silver cyanide was determined by using silver bromide instead of silver chloride, the value $2·19 \times 10^{-6}$ was obtained, a value which was also obtained when silver thiocyanate was used. The mean value was accordingly $2·2 \times 10^{-6}$, a value at variance with that deduced by Böttger from determinations of electrical conductivity. The interaction between potassium iodide and silver cyanide is very complete.

A different value for the solubility of silver cyanide, namely, $0·485 \times 10^{-6}$, is, however, obtained from experiments on the solubility of silver cyanide in ammonia (compare Bodländer and Fittig, Abstr., 1902, ii, 248). The complex ion $Ag(NH_3)_2^{\cdot}$ is present, whilst the complex salt formed is only slightly dissociated, the degree of dissociation increasing only slightly with increasing dilution. The dissolved salt has the formula $AgCN,NH_3$, and it is dissociated according to the equation $2AgCN,NH_3 = Ag(NH_3)_2' + Ag(CN)_2'$. The influence on the solubility of silver cyanide in ammonia exerted by the addition of other silver salts was also examined.

Owing to the slight solubility of silver cyanide in ammonia, the lowering of the freezing point was small.

Measurements of the electrical conductivity of silver cyanide in ammonia showed that the specific conductivity varied only slightly from that of ammonia. Interaction between silver iodide and potassium cyanide is expressed by $AgI + 2KCN = KAg(CN)_2 + KI$. The action is complete when the number of silver ions liberated from silver iodide is as great as the number from the decomposition of the complex ions. The ratio $[CN]'/[Ag(CN)_2]$ is $2·83 \times 10^{-3}$.

Silver sulphide is less soluble than silver iodide both in water and in aqueous potassium cyanide. The solubility product of silver sulphide is $[Ag^{\cdot}]^2[S''] = 17·9 \times 10^{-49}$. In order to determine the solubility of silver sulphide in potassium cyanide, the former was agitated at 25° with solutions of potassium cyanide of varying strengths. In solutions stronger than $N/0·05$, the complex silver salt $K_2Ag(CN)_3$ is formed, thus: $Ag_2S + 6KCN + H_2O = 2K_2Ag(CN)_3 + KSH + KOH$. The solubility of silver sulphide in potassium cyanide is $1·66 \times 10^{-17}$. From the relationship deduced by Bodländer between solubility and heat of formation, the electric potential of sulphur towards hydrogen is determined to be $-0·59$ volt. A. McK.

Theoretical Consideration of Reactions which take place in Two or More Successive Stages. Coenraad L. Jungius (*Zeit. physikal. Chem.*, 1904, 49, 368–375).—In reference to Smits and Wolff's experiments on the velocity of transformation of carbon monoxide (Abstr., 1903, ii, 276, 638), the author shows that chemical processes which are of the first order, but really take place in two or more stages, may be reversible. In other words, there may be incomplete reactions, the course of which does not harmonise with the number of molecules occurring in the chemical equation. In such a case, the usual formula, $dx/dt = k.C_1^m.C_2^n ...... - k'C_1'^{m'}.C_2'^{n'} ......$ cannot be applied, and the experiments may not point to any definite order of reaction. On the other hand, the chemical equation may be taken as a basis for the determination of the equilibrium constant.

J. C. P.

Application of the Phase Rule to Mixtures of Iron and Carbon. H. W. Bakhuis Roozeboom (*Zeit. Elektrochem.*, 1904, **10**, 489—491).—The author reproduces the diagram given previously (Abstr., 1900, ii, 728), with a few small alterations in the positions of the lines due to more recent experiments. T. E.

Reaction Velocity and Free Energy. Max Bodenstein (*Zeit. physikal. Chem.*, 1904, **49**, 61—69).—One of the chief problems of chemical kinetics is the determination of reaction velocity (V) in absolute units, and the discovery of the relationship between this and the other factors concerned, namely, the driving force (F) of the reaction and the chemical resistance (R). It is probable that these are connected by an expression analogous to Ohm's law, and that $V = F/R$, but R especially, made up as it is of the most diverse factors, is as yet far from susceptible of quantitative determination. As a beginning, however, to the study of these relationships, the author proposes a complete investigation of the velocities and equilibria characteristic of the combination of hydrogen with the halogens, cases which are unaffected by catalysts, and in which the course of reaction is in harmony with Guldberg and Waage's fundamental views of the relationship of velocity and equilibrium. Reichenbach has accordingly made a preliminary study of the rate of union of hydrogen and bromine with promising results. By a method similar to that used in another investigation (Bodenstein, Abstr., 1893, ii, 369; 1894, ii, 12; 1897, ii, 252), the course of change can be conveniently followed between 228° and 328°, within which range the reaction is practically non-reversible. An experiment at 650—750° showed that hydrogen bromide is dissociated under these conditions to the extent of 0·3—0·9 per cent. J. C. P.

Dissociation of Hydrogen Bromide and Hydrogen Chloride. Max Bodenstein and Arthur Geiger (*Zeit. physikal. Chem.*, 1904, **49**, 70—81. Compare Bodenstein, preceding abstract).—The extent of dissociation of hydrogen bromide and hydrogen chloride cannot be accurately determined by the method used in the case of hydrogen iodide (Bodenstein, 1893, ii, 369; 1894, ii, 12; 1897, ii, 252) because of the high velocity of the reactions involved. The relationship, however, between chemical equilibrium and electromotive force (see Knüpffer, Abstr., 1898, ii, 420; Dolezalek, *ibid.*, 421) furnishes the required result, which is, in the first place, the value of K, the equilibrium constant. The data necessary in the case of hydrogen chloride are obtainable from Dolezalek's paper (*loc. cit.*), and those necessary in the case of hydrogen bromide are recorded in the present paper. It follows from these that at 30° the percentage dissociation of hydrogen bromide is 6×10^{-8}, whilst that of hydrogen chloride is $6 \cdot 6 \times 10^{-15}$. The degrees of dissociation at higher temperatures may be deduced from the equation $d(\log K)/dT = -q/RT^2$, for q is known in each case, and its variation with temperature can be calculated. In this way the following values have been obtained for the percentage dissociation at high temperatures:

	Hydrogen chloride.	Hydrogen bromide.
600° abs.	15×10^{-7}	0·0035
1000 ,,	0·002	0·18
2000 ,,	0·8	6·0

J. C. P.

Oxidation of the Iodine Ion to Hypoiodite as an Intermediate Stage in Several Reactions. Johannes Brode (*Zeit. physikal. Chem.*, 1904, 49, 208—216. Compare Noyes and Scott, Abstr., 1896, ii, 158; Brode, Abstr., 1901, ii, 443; Bredig and Walton, Abstr., 1903, ii, 282).—The following reactions are compared: I, $2H_2O_2 = 2H_2O + O_2$, catalytically accelerated by iodine ions in neutral solution; II, $H_2O_2 + 2HI = 2H_2O + I_2$, in acid solution; III, $H_2O_2 + 2Na_2S_2O_3 + 2H^{\cdot} = 2H_2O + Na_2S_4O_6 + 2Na^{\cdot}$, catalytically accelerated by iodine ions in dilute acid solution. It is shown that in each case the course of change is governed by the equation $dx/dt = kc_1c_2$, where c_1 and c_2 are the concentrations of peroxide and iodine ions respectively. The velocity constants thus obtained for reactions II and III are equal, and half the value of the constant for reaction I. It is therefore supposed that in all three cases the velocity really measured is that of the intermediate reaction, $H_2O_2 + I' = H_2O_2 + OI'$, and that the double velocity in reaction I is due to a very rapid interaction of the hypoiodite with another peroxide molecule, thus: $OI' + H_2O_2 = H_2O + O_2 + I'$.

The author doubts whether any reaction of the first order is known that takes place at a measurable rate without a catalyst. Where a catalyst is necessary, there may be an intermediate reaction, as in the case considered above, and the reaction really studied is then one of the second order. The author, in fact, considers that in all reactions the governing formula is $dx/dt = kc_1c_2$ (or kc^2), and that any deviation from the course required by this formula is due to the superposition of several velocities. J. C. P.

Rate of the Reaction between Iodic and Hydriodic Acids. Saul Dushman (*J. Physical Chem.*, 1904, 8, 453—482).—The rate of the reaction in acetic acid solutions was determined. It was found that the rate was proportional to the second power of the concentration of the hydrogen ion, to the first power of the concentration of the iodate ion, and approximately to the second power of the concentration of the iodine ion. With iodine in excess, that is, with the tri-iodine ion present in excess, the rate was proportional to the square of the concentration of the hydrogen ion and to the first power of the concentration of both the iodine and tri-iodine ions. These results suggest equations in which the left-hand sides are respectively $2\overset{-}{\mathrm{I}} + 2\overset{+}{\mathrm{H}} + \overset{-}{\mathrm{IO}_3} =$ and $\overset{-}{\mathrm{I}} + \overset{-}{\mathrm{I}_3} + 2\overset{+}{\mathrm{H}} + \overset{-}{\mathrm{IO}_3} =$. The right-hand side of the first is probably $2\mathrm{HOI} + \overset{-}{\mathrm{IO}}$, but that of the second equation is doubtful. The authors offer the suggestion $\mathrm{HI} + \mathrm{HI}_3 + \overset{-}{\mathrm{IO}_3} = \mathrm{HOI} + \mathrm{HOI}_2 + \overset{-}{\mathrm{IO}}$, in which the hypothetical HOI_2 decomposes into I_2 and HOI.

L. M. J.

Enzyme Action. I. H. P. Barendrecht (*Zeit. physikal. Chem.*, 1904, **49**, 456—482).—Fuller details are given of work already reported (this vol., ii, 551). The equation governing the inversion of sucrose by invertase is $-dx/dt = mx/[x + n(a - x)]$, where a is the initial number of grams of sucrose in 100 c.c. of water, m is the quantity of invert sugar produced in the first minute, x is the unchanged sucrose at time t, and n is the absorptive power of invert sugar for the enzyme radiation relatively to that of sucrose. The data recorded by Brown (Trans., 1902, **81**, 377) are in harmony with this equation, and also with the modified equation $-dx/dt = m.x/[x + n(a - x) + 0{\cdot}5b]$, which provides for the case where b grams of dextrose or lævulose are initially present.

The synthetical action of enzyme radiation is further discussed, and formulæ are given for the cases in which the products of inversion undergo a secondary change before reversion can take place. The author's results are in harmony with Simon's views (Abstr., 1901, i, 256) rather than with those of Armstrong (Trans., 1903, **83**, 1305) and Lowry (Trans., 1903, **83**, 1314).

J. C. P.

Heterogeneous Catalytic Reactions. II. Autocatalysis in Heterogeneous Systems. Max Bodenstein (*Zeit. physikal. Chem.*, 1904, **49**, 41—60. Compare this vol., ii, 245).—Besides showing, as previously reported (this vol., ii, 413), that the decomposition of antimony hydride is a case of autocatalysis, and that the corresponding equation, $dx/dt = k(m + x)(a - x)$, represents the actual course of the reaction as determined by Stock and Guttmann (this vol., ii, 246), the author deals with other cases of autocatalysis in heterogeneous systems. Thus Cohen's observations on the decomposition of arsenic trihydride (Abstr., 1896, ii, 593; 1898, ii, 328) and the author's observations on the decomposition of hydrogen selenide (Abstr., 1899, ii, 639) may be quantitatively reproduced with the aid of the above equation. The decomposition of sodium thiosulphate by acids is an analogous case, for the sulphur formed in the reaction behaves as a catalyst, and it is found that Foussereau's numbers (*Ann. chim. Phys.*, 1888, [vi], **15**, 533) are in fair agreement with the demands of the above equation.

J. C. P.

Catalysis of Ethyl Acetate by Nitric Acid in Presence of Alkali Nitrates. Harald Lundén (*Zeit. physikal. Chem.*, 1904, **49**, 189—198. Compare Euler, Abstr., 1900, ii, 269).—For every 0·1 equivalent of potassium or sodium nitrate, the velocity of catalysis of ethyl acetate by nitric acid increases by 2·3 per cent.; this effect is half as great as the corresponding influence of chlorides on hydrochloric acid. The neutral salt action ("Neutralsalzwirkung") of the nitric acid itself is also about half that of hydrochloric acid.

The influence of the various ions on the velocity of catalysis is formulated thus:

$$K_{HCl} = A.m_H(1 + a.m_H + b.m_{Na} + c.m_{Cl})$$
$$K_{HNO_3} = A.m_H(1 + a.m_H + b.m_{Na} + d.m_{NO_3}),$$

where m is ionic concentration and A, a, b, c, d are constants. From the author's experiments, the values of the constants are: $A = 304\ (\pm 5)$, $a + c = 0·34\ (\pm 0·10)$, $b + c = 0·58\ (\pm 0·02)$, $a + d = 0·18\ (\pm 0·02)$, $b + d = 0·42\ (\pm 0·06)$. J. C. P.

Disintegration of Elements. HUGO KAUFFMANN (*Zeit. angew. Chem.*, 1904, **17**, 1393—1397).—A theoretical paper. A. McK.

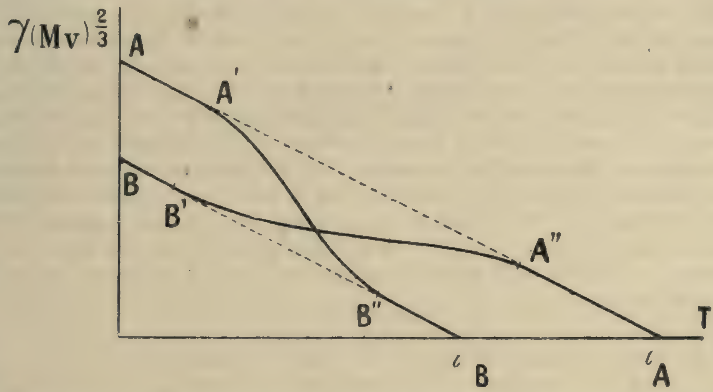
Supposed Change in Weight during Chemical Reactions. ANTONINO LO SURDO (*Nuovo Cimento*, 1904, [v], **8**, 45—67).—The author describes the methods employed by him to determine whether any change of weight occurs in the reaction taking place between iron and a basic solution of copper sulphate. The variations obtained are so nearly equal to the errors of experiment that it is concluded that no alteration in weight occurs in this reaction. T. H. P.

Atomic Weight of Radium and Relationships between the Atomic Weights of the Elements and their Spectra. W. MARSHALL WATTS (*Phil. Mag.*, 1904, **8**, 279—284).—The author calculates the atomic weight of radium by the law of Runge and Precht from the various pairs of the four elements, magnesium, calcium, strontium, and barium. The values vary between 222·7 and 263·6. The author considers the method of calculation gives results considerably too high. Calculations of the atomic weights of series of elements by the same law show that lithium and sodium give values approximately correct if considered in a series with copper, silver, and gold, but not when considered in series with potassium, rubidium, and cæsium. Similarly, magnesium fits in better with calcium and strontium than with zinc and cadmium. L. M. J.

Chemical Valency. JEAN BILLITZER (*Monatsh.*, 1904, **25**, 745—773).—The author considers that the valency of an element varies with the temperature; thus at the ordinary temperature carbon is quadrivalent, and therefore acetylene is an unsaturated compound, but at high temperatures, as that of the electric arc, carbon is bivalent and acetylene is formed as a saturated substance. Where a reaction is accompanied by a change in volume, the valency of an element may be effected by changes of pressure. At 3000° under a pressure of 0·001 atmosphere, 94 per cent. of carbon dioxide decomposes into carbon monoxide and water, whereas under 100 atmospheres pressure only 10 per cent. of carbon dioxide is decomposed. In both cases the carbon partly becomes bivalent, the higher pressure favouring quadrivalency. The valencies of the elements in a group of the periodic system vary inversely with the vapour tension. G. Y.

Passivity of Metals. OTTO SACKUR (*Chem. Zeit*, 1904, **28**, 954—956).—An historical survey dealing with the passivity of metals. A. McK.

Recognition of Tautomerism in Liquids. RUDOLF SCHENCK and E. ELLENBERGER (*Ber.*, 1904, **37**, 3443—3453).—The authors discuss tautomerism in liquids which do not undergo association. The molecular surface energy $\gamma(Mv)^{2/3}$ (Ramsay and Shields, Trans., 1893, **63**, 1089; Abstr., 1894, ii, 179) is plotted against temperature. The curve in the case of a pure liquid is a straight line. For the two distinct modifications A and B of a tautomeric liquid, two parallel straight lines would be obtained, but for a mixture of the two which changes in composition with the temperature a curve would be obtained, for example, in Fig. AA′ or BB′. Similarly if the temperature-coefficient K is calculated from the equation $\gamma(Mv)^{2/3} = K(2 - t - d)$.



For a normal liquid, the value is 2·12 Erg., but for one exhibiting tautomerism the value first approximates to the normal, then reaches a maximum, and then again approximates to the normal value, or, starting near the normal value, it reaches a minimum and again approximates to the normal value.

The latter case can be distinguished from variations due to association by determining the values at sufficiently low temperatures. In cases of association, the coefficient continues to decrease with the temperature, but with tautomerism a minimum is reached and then the coefficient again approaches the normal value. Dibenzoylacetone in a fused state, acetylacetone, and ethyl acetoacetate have been examined and the results confirm those obtained by previous investigators. For example, ethyl acetoacetate consists of one modification only (the ketonic) at all temperatures up to about 140°. J. J. S.

A Modified Kipp Apparatus. JOSEF LOCZKA (*Chem. Zeit.*, 1904, **28**, 729, 730).—The apparatus consists of a 3-necked Woulf's flask, above which is placed an acid container, the tapped stem of the latter passing down through the middle neck nearly to the bottom of the flask. The lower part of this stem is perforated and is surrounded by a glass tube. After placing a layer of pumice-stone in the flask, sufficient ferrous sulphide, marble, &c., according to the kind of gas which it is desired to produce, is added, and the acid allowed to run down from the upper vessel. The gas evolved is drawn by means of a tapped delivery tube leading from one of the necks of the flask. Any excess of acid running into the flask is caused to return to the acid container by a tube passing through the third neck of the flask and reaching from the bottom of the latter to the upper part of the acid vessel. All the tubes are of glass and the joints are ground in.

W. P. S.

New Form of Wash-bottle and Safety Bunsen Burner. Rudolf L. Steinlen (*Chem. Zeit.*, 1904, 28, 753).—The tube forming the mouth-piece of the wash-bottle reaches to the bottom of the latter and at its lower end is provided with a valve, which consists of a short dumb-bell-shaped piece of glass rod placed between two constrictions in the tube. With the upper constriction the rod forms an air-tight joint, but not with the lower. A similar valve, working in the opposite direction, is placed at the bottom of the delivery tube of the wash-bottle. The cork of the bottle has also passing through it a third short tube provided with a stopper-valve at its upper end, which is worked by the finger and serves as a safety-valve to the wash-bottle.

The safety Bunsen burner described is intended for use under water and air-baths. The flame is surrounded by a large inverted cone of fine copper gauze, the apex of which is clamped to the tube of the burner. The flat base of the cone also serves as a support for evaporating basins, &c. W. P. S.

A New Rapid Filter. G. Giemsa (*Chem. Zeit.*, 1904, 28, 752—753).—A number of glass rods are placed in an ordinary funnel. The upper ends of the rods are bent over to hook on the rim of the funnel, whilst the lower ends just reach to the junction of the conical part of the funnel with the stem. The apparatus filters thick solutions more quickly than do the ordinary ribbed funnels. W. P. S.

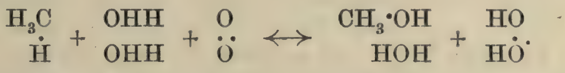
A New Incinerator. Ph. Schneider (*Chem. Zeit.*, 1904, 28, 781).—The author modifies an ordinary combustion oven, so that it can be used for incinerations or for volatilising ammonium salts.

W. A. D.

Inorganic Chemistry.

Dissociation Points of Some Chlorides. PETER FIREMAN and EDWARD G. PORTNER (*J. Physical Chem.*, 1904, **8**, 500—504).—If potassium iodide is brought close to the fumes given off by antimony pentachloride, a brown precipitate of iodine forms on the surface of the iodide. Other dissociable chlorides act similarly either cold or when heated, and the authors have endeavoured, by ascertaining the temperatures at which potassium iodide starch papers were coloured, to determine the dissociation temperature of these chlorides. The results obtained are as follows: phosphorus pentachloride, 157—158°; ferric chloride (anhydrous), 122—123°; cupric chloride (anhydrous), 344°; chromic chloride (anhydrous), 355°. L. M. J.

Retardation of Combustion by Oxygen. HENRY E. ARMSTRONG (*Proc. Roy. Soc.*, 1904, **74**, 86—89).—A theoretical paper. The initial stage of the combustion of a hydrocarbon is its hydroxylation; a stage is soon reached when "thermoschisms" begin, thus, dihydroxymethane breaks up as soon as it is formed into water and formic aldehyde, which is then converted into hydrogen and carbon monoxide. The more complex hydrocarbons are resolved into simpler "thermoschists" prior to oxidation. The combustion of methane is represented as follows:



$$\begin{array}{c}H_3C\\ \dot{H}\end{array} + \begin{array}{c}OHH\\ OHH\end{array} + \begin{array}{c}O\\ \ddot{O}\end{array} \longleftrightarrow \begin{array}{c}CH_3\cdot OH\\ HOH\end{array} + \begin{array}{c}HO\\ \dot{H}O^{\cdot}\end{array}$$

Carbon dioxide is a later product of change than the monoxide. The influence of oxygen in retarding combustion is noteworthy in the case of electrolytic gas. A. McK.

Union of Hydrogen with Sulphur, Selenium, and Tellurium. FRANCIS JONES (*Mem. Manchester Phil. Soc.*, 1904, **48**, xvi, 1—5).—Boiling sulphur was found to combine with hydrogen, dried with sulphuric acid and phosphoric oxide. On heating in a current of carbon dioxide similarly dried until no formation of hydrogen sulphide could be noticed and then introducing moisture into the gas stream, considerable formation of hydrogen sulphide ensued.

Sulphur and hydrogen were also found to unite completely on heating together in a sealed tube in a bath of boiling sulphur.

Sulphur, selenium, and tellurium were all readily combined with hydrogen when heated in the closed end of a tube filled with that gas and dipping at its open end into sodium hydroxide solution.

G. D. L.

Condition of Hydrogen Sulphide in Mineral Wells. FRIEDRICH AUERBACH (*Zeit. physikal. Chem.*, 1904, **49**, 217—223).—The author has determined the dissociation constant of hydrogen sulphide at 18°, and finds the value $0{\cdot}91 \times 10^{-7}$, which is intermediate between the values given by Walker and Cormack (Trans., 1900, 77, 5) and Paul (*Chem. Zeit.*, 1899, 23, 535). With the aid of this number and the corresponding one for carbonic acid (Walker and Cormack, *loc. cit.*), the author calculates the proportion of free and combined carbonic acid and hydrogen sulphide in several mineral waters of which analyses are available. A similar calculation may be made in the case where carbonic and boric acids are present together, and it appears that when the quantity of carbon dioxide is considerable the boric acid is practically all present in the free state (compare Grünhut, this vol., ii, 615). Under similar conditions, silicic and titanic acids are practically free and undissociated, and there are practically no CO_3'' ions. J. C. P.

Catalytic Preparation of Sulphur Trioxide. Georg Lunge and K. Reinhardt (*Zeit. angew. Chem.*, 1904, 17, 1041—1051. Compare Abstr., 1903, ii, 70).—The catalytic formation of sulphur trioxide from dry sulphur dioxide and atmospheric oxygen by means of ferric oxide is perceptible at a temperature slightly exceeding 400°, and attains its maximum of about 70 per cent. at 625°, above which the action decreases in intensity. It is immaterial whether the gases are dried by sulphuric acid and then by phosphoric oxide, or by sulphuric acid alone. Mixtures of arsenious oxide and ferric oxide have much the same influence on the catalytic formation of sulphur trioxide as has ferric oxide itself. Interaction between sulphur dioxide and oxygen proceeds to the extent of 70 per cent. at 625° when ferric arsenate is used as the catalyser. Ferric arsenite is not so suitable. Arsenic oxide is a very suitable catalyser, the maximum being attained at about 681°. The addition of small amounts of copper sulphate or of copper oxide to ferric oxide has no influence on the catalysis, whilst larger amounts of copper oxide decrease the rate of action. Copper oxide itself has a very slight catalytic action. The action of Jena glass or Berlin porcelain is very slight and cannot be detected below 700°. Silica, on the other hand, in the form either of rock-crystal or of amorphous quartz glass, has an appreciable influence. A. McK.

Phenomena observed during the Electrolysis of Concentrated Sulphuric Acid. B. G. Cobb (*Chem. News*, 1904, 90, 26—27).

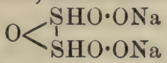
Behaviour of Sulphites towards Wood and Tanning Materials. Hans Bucherer (*Zeit. angew. Chem.*, 1904, 17, 1068—1073).—In the recovery of sulphur dioxide from the waste liquors from the manufacture of cellulose, calcium monosulphite is formed by the addition, first, of milk of lime, and finally of chalk. By this method, the solution is kept acid, and the amount of sulphur dioxide recovered is small, since the greater part of it remains combined with organic substances, possibly in the form of esters of sulphurous acid, which are much more stable in acid than in alkaline solutions.

It is not possible to estimate directly the amount of sulphur dioxide in the liquors by means of iodine, since aldehydic substances are present. When the liquors are distilled with hydrochloric acid and the sulphur dioxide thus expelled passed into an alkali hydroxide, which is then titrated with iodine, the results vary with the time the distillation has been conducted, since the organic compounds of sulphur dioxide are gradually decomposed by the mineral acid with the evolution of sulphur dioxide. The author has studied the behaviour of the sulphite waste liquors towards dilute sulphuric and hydrochloric acids, calcium carbonate, calcium hydroxide, and dilute sodium hydroxide.

The amount of milk of lime necessary for the formation of calcium monosulphite from the liquor is determined by distilling an aliquot portion of the latter with hydrochloric acid until no more sulphur dioxide passes over, and then adding milk of lime to the residue until the reaction is distinctly alkaline towards phenolphthalein. Sufficient milk of lime is added to the liquors to ensure a distinctly alkaline reaction at the completion of the action, in order that all the organic compounds of sulphur dioxide present may be decomposed.

The behaviour of sulphites towards tanning materials has also been examined. Sulphites can act as sulphonating agents without any reduction being caused with the substance acted on. When the product, obtained by the action of sulphites on resorcinol, is treated with alkali, a substance is obtained which is insoluble in ether and is regarded as a sulphonic acid. Resorcinol (1 mol.) unites with sodium hydrogen sulphite (3 mols.) to form a product in which sulphur dioxide cannot be detected by means of iodine. Trihydroxybenzene derivatives and tanning materials do not, however, form esters of sulphurous acid in the manner resorcinol does. A. McK.

Hyposulphites. HANS BUCHERER and ARTHUR SCHWALBE (*Zeit. angew. Chem.*, 1904, **17**, 1447—1451).—According to Schützenberger, sodium hyposulphite has the formula $NaHSO_2$, and, according to Bernthsen, $NaSO_2$ or $Na_2S_2O_4$. The grounds on which those formulæ are assigned are discussed.

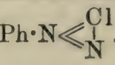
According to the author, sodium hyposulphite, obtained by salting out from an aqueous solution, contains at least 1 mol. of water of constitution, and the formula  $O<\begin{matrix}SHO\cdot ONa\\ |\\ SHO\cdot ONa\end{matrix}$ is assigned to it.

It has two hydrogen atoms replaceable by metals; it is neutral towards litmus. With formaldehyde, it forms an additive compound, which condenses with amines. A. McK.

Oxidation of Nitrogen. Comparative Yields by Division of the Current. FRANZ VON LEPEL (*Ber.*, 1904, **37**, 3470—3474).—When a current of 6 amperes and 14 volts is sent through 2 parallel discharge tubes by means of a Wagner Commutator, practically the same amount of nitric acid is obtained in each as would be produced by passing the same current through a single tube. Further division of the current is not economical. Comparative experiments made with a Wehnelt and a Wagner Commutator with stationary electrodes indicate that the Wagner is the more economical.

Experiments have also been made by dividing the current in a single vessel by means of a forked rotating anode on a flat cathode.

The results indicate that the length of spark, the rate at which air enters, the nature of the electrodes and of the cathode liquid, and also the velocity of rotation of the anode all affect the yield. When the rotation is rapid, a slower current of air can be used; the best yields are obtained by rotating the anode with a moderate velocity and sending in a moderate supply of air. J. J. S.

The Constitution of the Ammonium Compounds. John C. Cain (*Mem. Manchester Phil. Soc.*, 1904, **48**, xiv, 1—11).—The author suggests that the ammonium compounds are formed from ammonia owing to the assumption on the part of a halogen or oxygen (or sulphur) atom of higher valency. Thus ammonium hydroxide, ammonium chloride, and phenyldiazonium chloride are respectively formulated: $H_3N{:}OH_2$, $H_3N{:}ClH$,  $\mathrm{Ph{\cdot}N}\!\ll\!\begin{matrix}\mathrm{Cl}\\ |\\ \mathrm{N}\end{matrix}$. G. D. L.

Density of Nitrous Oxide. Lord Rayleigh (*Proc. Roy. Soc.*, 1904, **74**, 181—183. Compare Abstr., 1898, ii, 290).—In view of the higher value (1·5301) obtained by Leduc for the density of nitrous oxide, the author has carried out a fresh determination, purifying the gas with the aid of liquid air. The value now found is 1·5297.
J. C. P.

Hydrates of Nitric Acid. Friedrich W. Küster and Robert Kremann (*Zeit. anorg. Chem.*, 1904, **41**, 1—42).—A reply to Erdmann (Abstr., 1903, ii, 73. Compare Erdmann, this vol., ii, 26, and Küster, this vol., ii, 26), who claims that orthonitric acid, $N(OH)_5$, and other such compounds of nitric acid exist.

According to Erdmann, orthonitric acid, containing 63·63 per cent. of nitric acid, evaporates unchanged at −15°. The authors' experiments do not confirm Erdmann's. About 50 separate experiments were conducted with acids, containing from 61·76 to 77·78 per cent. of nitric acid, which were allowed to evaporate in a current of dry air at −15° and under a pressure of 60 cm. The nitric acid used was prepared by distilling potassium nitrate, and then purified by repeated freezing out from the distillate. Nitric acid melts at −41·3° and not at −47° as Berthelot states. The amounts of acid and of water carried over by the current of air were estimated by direct weighing and by titration with a $0{\cdot}2N$ borax solution; the results are given in detail and show that an acid containing 63·64 per cent. of nitric acid gives a distillate, under the experimental conditions employed, containing only 54 per cent. of nitric acid. An acid containing 66·1 per cent. of nitric acid gives a distillate of the same strength, whilst the distillates from acids of higher concentration are more concentrated than the acids themselves.

According to Erdmann, the high viscosity exhibited by the compound $O[N(OH)_4]_2$ is in accordance with its high molecular weight. It is pointed out that conclusions as to the molecular weight of compounds cannot be drawn from their viscosity constants. Besides, the experiments quoted show that an acid containing 65 per cent. of nitric acid possesses the greatest viscosity coefficient at +15° and −15°, and not an acid containing 70 per cent. of nitric acid and corresponding with Erdmann's hypothetical compound. The authors' viscosity determinations are in accordance with those of Graham. Erdmann quotes −39° as the melting point of his compound, $O[N(OH)_4]_2$. A mixture corresponding with $2HNO_3,3H_2O$ does not, however, exhibit a sharp melting point. Crystals begin to separate at −39°; when those, however, are separated from the mother liquor, they melt at −19° and have a composition corresponding with the trihydrate, $HNO_3,3H_2O$. Erdmann's tribasic acid, $NO(OH)_3$, is the hydrate, HNO_3,H_2O. Erdmann's tetrabasic acid, $O[NO(OH)_2]$, does not exist.

The complete freezing point curve of mixtures of water and nitric acid has been determined. The measurements were conducted in a Beckmann apparatus with a thermo-element of nickel and iron and a Deprez-D'Arsonval galvanometer. The solidification temperatures of nitric acid, from 0 to 100 per cent., are quoted. The curve represented shows that nitric acid forms two hydrates, $HNO_3,3H_2O$ and HNO_3,H_2O, corresponding with 53·84 and 77·77 per cent. by weight of nitric acid respectively. The former hydrate melts at −18·5°, the latter at −38·0°, whilst Pickering gives −18·2° and −36·8°. The curve possesses three minima, indicating the existence of three cryohydrates: at −43°, ice and $HNO_3,3H_2O$; at −42°, $HNO_3,3H_2O$ and HNO_3,H_2O; at −66°, HNO_3,H_2O and HNO_3.

Conductivity measurements of mixtures of nitric acid and water at −16° were made. The curves show that Erdmann's views are incorrect. The hydrates $HNO_3,3H_2O$ and HNO_3,H_2O exist in solution at −16°, the former being more stable than the latter. Dilatometric measurements were also made. The lowering of the freezing point caused by the addition of one of the components of dissociation of the monohydrate was measured, the monohydrate dissociating according to the scheme $HNO_3,H_2O \rightleftarrows HNO_3 + H_2O$. The lowering of the freezing point of the monohydrate by picric acid and of the trihydrate by acetic acid was measured. A. McK.

Formation of Nitrites and Nitrates by the Electrolytic Oxidation of Ammonia in the presence of Copper Hydroxide. Wilhelm Traube and Arthur Biltz (*Ber.*, 1904, **37**, 3130—3138).—It has been shown by Schönbein that copper is oxidised when immersed in an aqueous solution of ammonia in contact with air, whilst the ammonia is also oxidised to ammonium nitrite. The authors have studied the oxidation of ammonia by oxygen evolved electrolytically and have used copper hydroxide as a catalyser.

Practically no nitrite is formed at the anode when an aqueous solution of sodium hydroxide containing ammonia is electrolysed; when copper hydroxide, however, is added to such a solution, almost the whole of the oxygen evolved at the anode is used up in converting the ammonia present into ammonium nitrite. Platinum or iron electrodes were used in the experiments quoted, and the current strength varied from 5 to 15 amperes.

As the electrolysis proceeds, the amount of nitrite formed gradually increases, and then, after a certain time, decreases owing to the oxidation to nitrate; if the electrolysis be continued for a considerable time, the liquid at the anode is found to contain only nitrate and no nitrite. A. McK.

A Reagent for Phosphorus, Arsenic, or Antimony Hydride. PAUL LEMOULT (*Compt. rend.*, 1904, **139**, 478—480).—When hydrogen phosphide is passed into a solution of mercuric iodide containing potassium iodide (HgI_2,nKI, with $n > 2$), an orange-yellow, crystalline solid is formed which becomes brick-red when dry, has the composition PHg_3I_3, is decomposed slowly by hot or cold water, more rapidly by alkalis, forming an iodide and a black powder, which in its turn breaks down into hydrogen phosphide, mercury, and an alkali phosphite; nitric acid or aqua regia decomposes the compound readily, the former giving a mercury iodonitrate, $HgINO_3$, and phosphoric acid; the latter liberating iodine and yielding phosphoric acid and a mercury salt.

Similar characteristic compounds are obtained when arsenic or antimony hydride replace the hydrogen phosphide in the above reaction, the arsenic compound having a brown, and the antimony a brownish-black, colour. Ammonia only reacts with concentrated solutions of the reagent, giving the compound $HgI_2,2NH_3$, in beautiful, crystalline needles 1 cm. long (compare François, Abstr., 1899, ii, 657).

M. A. W.

Preparation of Phosphorus Tribromide. ANASTASIOS C. CHRISTOMANOS (*Zeit. anorg. Chem.*, 1904, **41**, 276—290. Compare this vol., ii, 614).—Details of the method of preparing phosphorus tribromide by the action of bromine on yellow phosphorus under a layer of benzene are given. Phosphorus tribromide boils at 171° (corr.) under 761 mm. pressure and melts at $-41·5°$ under 761 mm. pressure. It has $n_D = 1·6945$ at 19·5°, and the sp. gr. 2·88467 at 0°/4°, 2·85234 at 15°/4°, and 2·82053 at 27°/4°. When a current of oxygen is passed into boiling phosphorus tribromide, the action, represented by $4PBr_3 + 5O_2 = 2P_2O_5 + 6Br_2$, takes place.

A lecture experiment illustrating the action of water on phosphorus tribromide is described. The action on it of absolute alcohol, phenol, glycerol, copper nitrate, sodium, and magnesium respectively is also described. A. McK.

Direct Separation, without Liquefaction, of the most Volatile Gases of the Air. Sir JAMES DEWAR (*Ann. Chim. Phys.*, 1904, [viii], **3**, 12—20).—Taking advantage of the selective absorptive power exhibited by wood charcoal towards gases (compare this vol., ii, 652), the author has separated the oxygen and nitrogen from the more volatile gases of the air; the unabsorbed residue from 200 c.c. of air showed, when spectroscopically examined, the *C* and *F* lines of hydrogen, the yellow and some orange lines of neon, and the yellow and green lines of helium. By this method, also, the presence of helium has been detected in the gases from the mineral waters of

Bath, of neon in the gases from London water and sea water, and of neon and hydrogen in the gases dissolved in petroleum. M. A. W.

Formation of Helium from the Radium Emanation. F. HIMSTEDT and GEORG MEYER (*Ann. Physik*, 1904, [iv], **15**, 184—192).—The most stringent precautions (for example, heating for 20—30 minutes in a vacuum at a bright red heat) have been taken to free the radium preparations from any occluded helium, but in spite of these it appears that fresh helium is produced from the radium preparations after a longer or shorter interval (compare Ramsay and Soddy, Abstr., 1903, ii, 622; Dewar and Curie, this vol., ii, 255).

J. C. P.

Liquefaction of Helium. Sir JAMES DEWAR (*Compt. rend.*, 1904, **139**, 421—422).—When a tube full of hydrogen and connected with a side-tube containing wood charcoal (compare this vol., ii, 652) is cooled in liquid hydrogen, the hydrogen is absorbed by the charcoal, producing a vacuum of so high an order that an electric discharge in the tube is impossible; when the tube of hydrogen is replaced by one of helium and cooled to 15° absolute, a coil, capable of producing a spark 40 cm. long in air, only causes an intermittent phosphorescence in the middle of the tube. The author concludes from his experiments that the boiling point of helium is about 6° absolute.

M. A. W.

Actinium. ANDRÉ DEBIERNE (*Compt. rend.*, 1904, **139**, 538—540).—Experimental observations are cited which indicate that Giesel's emanium (compare Abstr., 1903, ii, 193) is identical with actinium. The elements associated with each are the same, the phosphorescence phenomena are identical, and so are the time constants of the decay of the induced activity. As a result of fractionating the rare earths by means of the double nitrates which the rare earth metals form with manganese, it is found that the actinium accumulates in the neodymium and samarium fractions, the lanthanum fraction being almost inactive. H. M. D.

Evolution of Structure in Metals. G. CARTAUD (*Compt. rend.*, 1904, **139**, 428—430).—From an examination of the etch figures obtained by the action of picric acid in acetone solution on the polished surface of such metals as zinc, tin, or lead, the author concludes that the final crystalline structure of the metal is evolved from a primitive cellular structure. M. A. W.

Electrolysis of Alkali Chlorides, using Iron Plates over which Mercury Flows. WILHELM KETTEMBIEL and C. F. CARRIER, jun. (*Zeit. Elektrochem.*, 1904, **10**, 561—568).—The cathode consists of an amalgamated iron plate over which mercury is allowed to flow in a thin sheet. It is very difficult to amalgamate the iron properly, and the prepared plate must be preserved with a current flowing to it, otherwise it oxidises very rapidly. The yield of alkali metal obtained increases rapidly with the current density up to about 0·35 ampere per sq. cm. When the anode is enclosed in a porous pot, the yield of metal is from 85 to 90 per cent. of the theoretical value, but without a diaphragm it is much smaller. The potassium amalgam obtained contained from 1 part of potassium in 6000 of mercury to 1 part in 30,000. Within these limits, the yield is hardly affected by the rate of flow of the mercury. T. E.

Ammonia Soda Process from the Standpoint of the Phase Rule. P. P. Fedotéeff (*Zeit. physikal. Chem.*, 1904, 49, 162—188).—The ammonia soda process has to be considered under the category of reciprocal salt pairs, the four salts involved being sodium and ammonium chlorides and hydrogen carbonates. To furnish the experimental data required for such a study, the author has determined the solubility of each of the above salts in presence of each of the others at various temperatures up to 45°, a lower temperature, however, being prescribed in some cases by the limited stability of ammonium hydrogen carbonate. The solutions were in all cases saturated with carbon dioxide. Further, the author has studied both at 0° and 15° the composition (1) of a saturated solution in contact with the solid phase $NaHCO_3 + NH_4Cl + NH_4HCO_3$; (2) of a saturated solution in contact with the solid phase $NaHCO_3 + NH_4Cl + NaCl$. The solution (1) is an incongruent saturated solution (see Meyerhoffer, Abstr., 1896, ii, 414), that is, although ammonium hydrogen carbonate is present in the solid form, there is none of it in the solution, which contains sodium chloride instead (this does not hold, however, above 32°). Addition of excess of sodium chloride to solution (1) changes it into solution (2), which is a congruent saturated solution. It appears that a congruent saturated solution is obtained when the radicle present in the solution in the greatest concentration is twice represented among the three solid salts.

The results are represented in the usual graphical manner, and without reference to the diagrams, the author's deductions cannot be fully explained. It is possible to deduce the way in which, and the extent to which, the yield of solid sodium hydrogen carbonate is affected by changing the temperature or the concentration of the solutions, and also the maximum yield that may be expected under given conditions. It is theoretically possible to precipitate about 80 per cent. of the sodium chloride taken in the form of hydrogen carbonate, and a yield of 75 per cent. should be practically obtainable. From the purely chemical standpoint, Solvay's method is not to be regarded as the best form of the ammonia soda process. It would appear to be more rational to start from solid or dissolved sodium chloride and solid ammonium hydrogen carbonate. J. C. P.

Borax of Abnormal Composition. Leopold Spiegel (*Chem. Zeit.*, 1904, 28, 750—751).—A sample of borax examined by the author gave unusual results on titration with *N*/5 sulphuric acid, using *p*-nitrophenol as indicator. This sample, on further investigation, was found to consist of sodium triborate. As the result of a considerable number of experiments, it was ascertained that solutions of borax (diborate) containing excess of boric acid deposit crystals of sodium triborate. Many samples of commercial borax were examined, but, with the above exception, all consisted of sodium diborate, showing that the triborate seldom occurs. W. P. S.

Silver Chromate. I. BENJAMIN M. MARGOSCHES (*Zeit. anorg. Chem.*, 1904, **41**, 68—84).—Silver chromate, Ag_2CrO_4, is best prepared by interaction of an easily soluble silver salt and a normal chromate, when it is precipitated as an indistinctly crystalline powder. The chromate is also formed in dark green crystals by the action of an excess of water on silver dichromate. Other methods of preparation are quoted. Data quoted in the literature respecting the solubility of silver chromate in water are very discordant.

Silver chromate dissolves in ammonia of sp. gr. = 0·94, to form the compound $Ag_2CrO_4,4NH_3$. The interaction between alkali haloids and silver chromate proceeds only with freshly precipitated or moist silver chromate. Silver chromate is slightly soluble in a concentrated solution of potassium chromate; it is practically insoluble in silver nitrate solution. The data in the literature respecting the behaviour of silver chromate towards nitric acid are also at variance.

A. McK.

Solubility of Calcium Sulphate in Solutions of Nitrates. ATHERTON SEIDELL and JOSEPH G. SMITH (*J. Physical Chem.*, 1904, **8**, 493—499).—The solubility is given in grams per litre, and the densities of the solutions are also recorded. In solutions of sodium nitrate, the solubility reached a maximum (9·3 grams per litre) for about 300 grams of sodium nitrate per litre, after which it decreased. In solutions of potassium nitrate, the results were complicated by the formation of syngenite at higher concentrations of the nitre. In solutions of magnesium nitrate, the solubility steadily increases, so that for 514 grams of magnesium nitrate per litre it reaches over 15 grams per litre, that is, over seven times the solubility in pure water. In solutions of calcium nitrate, the solubility decreases. Tables and curves of the results are given. L. M. J.

Electrolytic Preparation of Calcium. OTTO RUFF & WILHELM PLATO (D.R.-P. 153731).—The best results in the electrolytic preparation of calcium are obtained by employing a bath consisting of 83·5 per cent. of calcium chloride and 16·5 per cent. of calcium fluoride, melting at 655° and having a sp. gr. 2·5. A carbon anode and an iron cathode are employed. C. H. D.

Action of Carbon Dioxide on Magnesium Hydroxide. M. MONHAUPT (*Chem. Zeit.*, 1904, **28**, 868).—When a current of carbon dioxide is passed through water in which magnesium hydroxide is suspended, a liquid is obtained containing a varying amount of magnesium oxide. In three experiments, the author obtained, respectively, 10·7, 9·7, and 11·3 per cent. By prolonged heating at 50—60°, or by adding an equal volume of alcohol, carbon dioxide is gradually evolved and a precipitate is obtained having the composition $MgCO_3,3H_2O$.

The portion not dissolved by the water also has the same composition, but it obstinately retains some 3·7 per cent. of unchanged magnesium hydroxide. L. DE K.

Zinc-magnesium Alloys. OCTAVE BOUDOUARD (*Compt. rend.*, 1904, **139**, 424—426. Compare Abstr., 1901, ii, 512; 1902, ii, 141, 501; 1903, ii, 78, 480).—The melting points of a series of mixtures of zinc and magnesium containing from 5 to 90 per cent. of magnesium show a maximum (570°) and two minima (355° and 332°); the maximum represents the melting point of the compound Zn_2Mg, which can be isolated in the form of a metallic powder by the prolonged action in the cold of 0·3 per cent. hydrochloric acid solution on the mixture containing 80 per cent. of zinc. A second compound, $ZnMg_4$, can be similarly isolated by the action of a warm 0·5 per cent. solution of ammonium chloride on the mixture containing 30 per cent. of zinc. The alloys of zinc and magnesium are white in colour, more or less bright, and their brittleness increases with the proportion of zinc; the alloy containing 10 per cent. of zinc can be sawn and filed, whilst those containing 50—90 per cent. break in the process of sawing.

M. A. W.

Deposition of Zinc from Zinc Chloride dissolved in Acetone. HARRISON EASTMAN PATTEN (*J. Physical Chem.*, 1904, **8**, 483—487).—A curve is given for current density (between electrodes 3 sq. cm. in area) and *E.M.F.* The results show that a residual current is obtained in which the curve is almost a straight line; at about 2 volts, however, the curve bends to give the true *C/E.M.F.* curve. This is a straight line, which indicates a specific conductivity of $2·99 \times 10^{-2}$ at 20·5° and a polarisation *E.M.F.* of 1·90 volts; or, if the latter be taken from the intersection of the two straight line portions of the curve, of 2·14 volts. The zinc can be deposited steadily with a current density as low as 2 amperes per square foot, and at 40 amperes per square foot it trees out at the edges. When the thickness of the coating reaches about 1 mm., the deposit becomes spongy. The deposit was further found to contain about 1 per cent. of carbon.

L. M. J.

Phosphorescent Zinc Sulphide. H. GRÜNE (*Ber.*, 1904, **37**, 3076—3077).—Pure zinc sulphide is not phosphorescent, but the addition of a trace of copper, silver, lead, bismuth, tin, uranium, or cadmium causes it to become so. Copper produces the best result, 1 part of copper in 10,000 causing a beautiful green phosphorescence. The addition of manganese, on the other hand, produces a yellowish-red phosphorescence, and the zinc sulphide in this case, when scratched or rubbed, emits light spontaneously. W. A. D.

Glowing of Sidot's Blende under the Influence of Ozone. RUDOLF SCHENCK and F. MIHR (*Ber.*, 1904, **37**, 3464—3467).—Hexagonal zinc sulphide, Sidot's blende, glows intensely under the influence of a small amount of ozonised oxygen and also scintillates. The blende scintillates feebly when kept in a dark room removed from all radioactive substances and from ozone. J. J. S.

Solubility of Copper Oxide, Hydroxide, and Carbonate in Ammonia. Ernst Murmann (*Chem. Centr.*, 1904, ii, 410; from *Oesterr. Chem. Zeit.*, 7, 272).—In preparing an ammoniacal solution of copper hydroxide, it was found that only a portion of it dissolved even in presence of a large excess of ammonia, but when a quantity of ammonium carbonate or other ammonium salt equal to about half the copper compound was added, the whole of the latter went into solution. Pure calcined copper oxide is very sparingly soluble in ammonia, but considerably more so in presence of ammonium salts. E. W. W.

Complex Hydroxides of Copper, Nickel, Cadmium, Zinc, and Silver with Ammonia. W. Bonsdorff (*Zeit. anorg. Chem.*, 1904, **41**, 132—192).—Copper hydroxide, prepared by the action of sodium hydroxide on copper ammonium sulphate, was dissolved in ammonia, the excess of which was removed in a vacuum over sulphuric acid. The hydroxides of nickel, cadmium, and zinc were acted on by ammonia in a similar manner. Potential measurements were made by Bodländer's method at 25° as contrasted with the normal electrode, Hg | HgCl and *N*KCl solution. Experiments with copper and nickel were unsuccessful. Difficulties were encountered in the preparation of constant electrodes, which were obtained, however, from potassium zinc cyanide with a little mercury.

The complex cathion of cadmium ammonium hydroxide is represented by $Cd_m(NH_3)_{4m}$, whilst the cathion with zinc ammonium hydroxide is $Zn_m(NH_3)_{3m}$.

Measurements of the electrical conductivity of copper hydroxide in ammonia show that, when the concentration of ammonia is small, one or more copper ammonia bases are present in solution. Comparison of the conductivity curves of copper hydroxide and ammonia with the corresponding curves of barium hydroxide and ammonia indicate that from concentrations of ammonia exceeding 3—4 *N* onwards a somewhat strong copper ammonia base is present in the solution. The number of ammonia molecules in this strong base is greater than with the weaker bases, being probably greater than 4. Conductivity measurements of nickel and cadmium hydroxides and of silver oxide in ammonia show that they form strong bases with ammonia.

From conductivity measurements of solution of zinc hydroxide in ammonia, it follows that zinc hydroxide, in contradistinction to cadmium hydroxide, forms very weak ammonia bases.

Measurements of the concentration of hydroxyl ions by Koelichen's method corroborate the result of the conductivity determinations in the cases of solutions of copper and zinc in ammonia.

Determinations of the solubility of copper, nickel, cadmium, and zinc hydroxides respectively in ammonia show that the hydroxides in question easily suffer changes, but it is difficult to obtain well-defined modifications. When the excess of ammonia is small, 1 atom of copper combines with $2NH_3$, whilst 1 atom of cadmium or of nickel combines with $4NH_3$.

The complex copper ammonia bases are thus constituted,

$$Cu_m(NH_3)_{2m}(OH)_{2m},$$

whilst the nickel and cadmium ammonia bases have the constitution $Ni_m(NH_3)_{4m}(OH)_{2m}$ and $Cd_m(NH_3)_{4m}(OH)_{2m}$. A. McK.

Metallic Nitroso-compounds. VOLKMAR KOHLSCHÜTTER and M. KUTSCHEROFF (*Ber.*, 1904, 37, 3044—3052).—The amount of nitric oxide absorbed by cupric chloride solutions diminishes as the solution is diluted with water, but, on the other hand, increases rapidly when strong hydrochloric acid is used as the diluent. The amount of nitric oxide absorbed per molecule of cupric chloride in methyl- or ethyl-alcoholic solutions at first increases and finally decreases again as the solutions are diluted. In acetone solutions, very much more nitric oxide is absorbed, and the amount increases on dilution, a similar increase being manifested by solutions in formic acid. E. F. A.

Dissociation of Copper Sulphate and Decomposition of Copper Anodes. DONATO TOMMASI (*Chem. Centr.*, 1904, ii, 180; from *Electrochem. Zeit.*, 11, 56—57).—When a chemically pure copper sulphate solution is boiled, a basic salt is deposited which, when subsequently left to itself in the cold for 24 hours, does not dissolve to any great extent; the more concentrated the copper sulphate solution, the more strongly basic is the deposit. Even at the ordinary temperature, a copper sulphate solution decomposes appreciably in the course of a year. These observations may explain the deposit that appears at a copper anode during the electrolysis of copper sulphate or dilute sulphuric acid. J. C. P.

The Rendering Active of Oxygen. X. Autoxidation of Cerous Salts. CARL ENGLER (*Ber.*, 1904, 37, 3268—3273. Compare Abstr., 1903, ii, 599; this vol., ii, 165, and Baur, Abstr., 1903, ii, 729; this vol., ii, 339).—The large absorption of gas (oxygen) observed by Baur is due to carbon dioxide present in the gas. This carbon dioxide is formed when the carbonate solution is treated with acid to form the hydrogen carbonate, and if care is not taken is transferred to the absorbing vessel. In all cases, the amount of peroxide formed agrees with the ratio 1 mol. of oxygen for 2 atoms of cerium, and the absorption confirms this if all carbon dioxide is first removed.
J. J. S.

Preparation of the Cerium Earths by Aid of their Alkali Double Carbonates. RICHARD J. MEYER (*Zeit. anorg. Chem.*, 1904, 41, 97—125).—The following alkali double carbonates were prepared and analysed: *lanthanum potassium carbonate*, $K_2La_2(CO_3)_4,12H_2O$, formed by the gradual addition of an aqueous solution of lanthanum chloride to an aqueous solution of potassium carbonate and then crystallising the resulting precipitate, forms silky crystals; *lanthanum sodium carbonate*, $Na_6La_4(CO_3)_9,20H_2O$ (?), is gelatinous; *lanthanum ammonium carbonate*, $(NH_4)_2La_2(CO_3)_4,4H_2O$, is crystalline; *cerium* *potassium carbonate*, $K_2Ce_2(CO_3)_4,12H_2O$, assumes a faintly yellow colour on exposure to air; *cerium sodium carbonate*,

$$Na_6Ce_4(CO_3)_9,24H_2O\ (?),$$

is amorphous; *cerium ammonium carbonate*, $(NH_4)_2Ce(CO_3)_4,6H_2O$, forms tiny crystals and assumes a yellow colour on exposure to air; *praseodymium potassium carbonate*, $K_2Pr_2(CO_3)_4,12H_2O$, crystallises in tiny needles; *praseodymium sodium carbonate*, $Na_6Pr_4(CO_3)_9,22H_2O$ (?), is amorphous; *praseodymium ammonium carbonate*,

$$(NH_4)_2Pr_2(CO_3)_4,4H_2O,$$

forms bright green crystals; *neodymium potassium carbonate*,

$$K_2Nd_2(CO_3)_4,12H_2O,$$

forms needles grouped in rosettes; *neodymium sodium carbonate*, $Na_6Nd_4(CO_3)_9,4H_2O$, crystallises in prisms; *neodymium ammonium carbonate*, $(NH_4)_2Nd_2(CO_3)_4,4H_2O$, forms regular prisms. The constitution of the sodium salts given is not so certain, owing to the ease with which they are decomposed. Whilst the ammonium and sodium salts described are soluble with great difficulty in solutions of the corresponding alkali carbonates, the potassium salts are easily soluble in concentrated potassium carbonate solution, although the degree of solubility in the case of the compounds of the four rare metals examined is very different; thus the double carbonates are precipitated by the addition of water to their concentrated solutions in the following sequence: lanthanum, praseodymium, cerium, and neodymium. Lanthanum can accordingly be almost completely separated from cerium and didymium by precipitating as the double carbonate several times.

Traces of cerium can be detected by the yellow coloration formed in solutions of its alkali carbonates by peroxidation.

Praseodymium oxide, containing traces of cerium, neodymium, and lanthanum, can be completely freed from cerium and neodymium by the potassium carbonate method, whilst lanthanum can be removed almost entirely by systematic crystallisation of the praseodymium oxalate from nitric acid.

Praseodymium peroxide, $4PrO_2,Pr_2O_3$, is obtained by heating praseodymium oxalate to a low red heat, whilst the oxide, PrO_2, is obtained by Brauner's method by heating a mixture of praseodymium nitrate and potassium nitrate at 400—450°.

The pure praseodymium suboxide, Pr_6O_{11}, could not be oxidised to PrO_2 by means of cerium dioxide.

The separation of pure praseodymium from a solution in citric acid could not be effected by Baskerville and Turrentine's method (this vol., ii, 261). A. McK.

Light Aluminium Alloys. JOSEPH W. RICHARDS (*Chem. Centr.*, 1904, ii, 297; from *J. Franklin Inst.*, 157, 394—395).—From a lecture given by the author. The effects of alloying aluminium with chromium, manganese, copper, nickel, tin, silver, tungsten, and zinc are described. J. C. P.

Artificial Production of Rubies by Fusion. AUGUSTE VERNEUIL (*Ann. Chim. Phys.*, 1904, [viii], 3, 20—48).—Artificial rubies in the form of spheroids having a diameter of 5 to 6 mm. and weighing 2·5 to 3 grams (12 to 15 carats) can be obtained by allowing a blow-pipe flame, rich in hydrogen or carbon, to play on the extremity of a small cylinder of alumina, while a mixture of alumina and 2·5 per cent. of chromium oxide in the form of a powder is mechanically blown with the oxygen into the tube of the blow-pipe, and thus deposited on the surface of the fused mass of alumina. The artificial stones thus obtained are identical in physical and crystallographical properties with the natural gems, from which, however, they can be detected by the presence of minute bubbles visible only under the microscope.

M. A. W.

Aluminium Hydroxide. I. Franz Russ (*Zeit. anorg. Chem.*, 1904, **41**, 216—230).—The conditions were determined under which solutions of sodium aluminate decompose with the formation of the crystalline variety of aluminium hydroxide; these conditions depend on the ratio $Al_2O_3 : Na_2O$, on the temperature, and on the concentration.

Whilst solutions of sodium aluminate of the type $Al_2O_3 : Na_2O = 1 : 3$ are very stable, the decomposition begins when this ratio sinks below 1 : 2. The formation of the crystalline hydroxide is favoured by low temperatures. In order to determine the dependence of the spontaneous decomposition of a solution of known composition on its concentration, solutions of the type $Al_2O_3 : Na_2O = 1 : 1{\cdot}24$ were examined in different concentrations. The crystalline variety of aluminium hydroxide does not separate when the density of the sodium aluminate solution is below 1·17; with solutions where the density is below 1·17, colloidal alumina is first formed, and this, in the course of time, is transformed into the crystalline modification.

The existence of two hydroxides is assumed, the β-variety being the more stable, and its transformation from the α-variety is accelerated by the presence of hydroxyl ions. The β-variety is practically insoluble in *N*-sulphuric acid at the ordinary temperature. The solubility of the β-hydroxide in solutions of sodium hydroxide of varying concentrations increases with increase of hydroxyl ions.

From the results obtained, the most favourable conditions are indicated under which aluminium hydroxide can be obtained from sodium aluminate solutions according to Baeyer's process. A. McK.

"Ageing" of Clays. Paul Rohland (*Zeit. anorg. Chem.*, 1904, **41**, 325—336).—Such substances as form colloidal solutions with water possess plasticity to a greater or less degree. Clay and porcelain contain such colloidal substances, the union of which with water to form aluminium silicate is the cause of the plasticity; the degree of plasticity is expressed by the ratio of the inactive amount to the active mass. The coagulation of these colloids may be accelerated by catalysers, this acceleration being a function of the hydrogen and hydroxyl ions. The increase of the degree of plasticity during the "ageing" is accounted for as follows: the hydroxyl ions of the solutions in contact with the clay are neutralised by the fermentation of the organic substances present; excess of hydrogen ions results and coagulation ensues. The degree of plasticity of clays may be increased by the addition of colloids, such as tannic acid, dextrin, or aluminium hydroxide. A. McK.

Nature of the Alkaline Solution of Chromium Hydroxide. WALTER HERZ (*Chem. Centr.*, 1904, ii, 178).—Kremann's objections (Abstr., 1903, ii, 54, 465) to regarding the alkaline solution of chromium hydroxide as a colloidal solution are criticised (compare also Fischer and Herz, Abstr., 1902, ii, 564; Bredig, Abstr., 1903, ii, 263). The chrome alum used by Kremann for his dialysis experiments contained chromium-sulphuric acids, and was therefore unsuitable. If green chromium chloride is used, no dialysis takes place in 36 hours, even with alkali in the outer vessel. J. C. P.

The Action of Nitric Oxide on Chromous Salts. VOLKMAR KOHLSCHÜTTER (*Ber.*, 1904, 37, 3053—3055. Compare Chesneau, Abstr., 1899, ii, 661).—When saturated with nitric oxide, chromous salts give brilliant red solutions. Apparently, when chromous salt solutions absorb nitric oxide, this is reduced either to ammonia in neutral solutions or to hydroxylamine in acid solutions. The amount of hydroxylamine in these solutions is unaltered by heating with hydrochloric acid. More chromous chloride is required to convert a given weight of nitric oxide into ammonia than into hydroxylamine. E. F. A.

Ammonium Hydrogen Salt of Chromatodiperacid. KARL A. HOFMANN and H. HIENDLMAIER (*Ber.*, 1904, 37, 3405—3407. Compare this vol., ii, 410).—The action of acetic acid on the ammonium salt of chromatodiperacid leads to the formation of the *ammonium hydrogen* salt, $CrO_2(O\cdot O\cdot NH_4)(O\cdot OH)$; this is also obtained when a mixture of a cold saturated ammonium chromate solution and 10 per cent. acetic acid is oxidised with 30 per cent. hydrogen peroxide at 0°. It crystallises in dark reddish-violet, glistening, double refractive prisms, and dissolves in water to a reddish-brown solution, which, on warming, evolves oxygen and finally contains ammonium dichromate. It is less explosive than the diammonium salt when heated or moistened with concentrated sulphuric acid; in the presence of ether, and on addition of dilute sulphuric acid, it forms the blue solution of perchromic acid. With baryta water, barium chloride, and lead acetate solution, it gives coloured precipitates which change into the respective chromates. The *silver* salt is blue by transmitted, scarlet by reflected, light, and is comparatively stable.

On addition of dilute sulphuric acid to the alcoholic solution of the ammonium salts of chromatodiperacid, the solution becomes blue, and, on warming, green, the change being accompanied by oxidation of the alcohol. G. Y.

Unstable and Metastable Equilibria in Iron-Carbon Alloys. E. HEYN (*Zeit. Elektrochem.*, 1904, 10, 491—504).—The effects of hardening and tempering steels with varying quantities of carbon are studied, mainly by means of micro-photographs. When steel containing less than 0·95 per cent. of carbon is cooled slowly, so that stable equilibrium is attained, it consists entirely of ferrite (pure iron) mixed with perlite. The origin of the perlite is as follows: when the fused steel solidifies, crystals of γ-iron containing carbon in solid solution are deposited; on further cooling, these crystals decompose into β-iron and crystals with a higher percentage of carbon; at a still lower temperature (about 800°), the β-iron changes into α-iron (these are microscopically identical). Finally, at 700°, the solid mass consists of crystals of α-iron mixed with crystals containing 0·95 per cent. of carbon. Below 700°, the latter decompose into a mixture of iron and iron carbide, Fe_3C (cementite), with a very fine-grained structure consisting of alternate layers of the constituents; this mixture is perlite. When the quantity of carbon present exceeds 0·95 per cent., the excess crystallises out as cementite. In slowly cooled steels, therefore, microscopic examination shows ferrite mixed with increasing quantities of perlite up to 0·95 per cent. carbon (this mixture consists entirely of perlite) and, with more carbon, perlite mixed with increasing quantities of cementite.

When a steel is quickly cooled from a temperature above 700°, however, the stable equilibria are not attained; the greater the rate of cooling, the more completely are the constituents which exist at the high temperature preserved in the cold steel. In steel containing less than 0·95 per cent. of carbon, the homogeneous mixed crystals will decompose into crystals containing more and less carbon than the original steel, whilst steel containing more than 0·95 per cent. of carbon yields mixed crystals containing less carbon than the original material and crystals which approach more nearly to cementite the more slowly the cooling takes place. The author proposes to retain the name martensite for all these partially decomposed mixtures, instead of giving the constituent which most nearly approaches cementite the special name austenite. The author's experience of the properties of austenite is not entirely in accord with that of Osmond.

Osmond's view that troostite is a product intermediate between martensite and perlite is confirmed. Very rapid cooling gives martensite, somewhat less rapid cooling yields troostite, whilst slow cooling leads to perlite. If a rectangular piece of steel is quenched in water, the corners (which are most rapidly cooled) consist of martensite, the internal portions being troostite. When tempered, both troostite and martensite pass into "sorbite," which appears to be an almost molecular mixture of ferrite and a substance resembling cementite. The presence of a little manganese diminishes the tendency to form troostite, in other words, it makes super-cooling easier.

In the diagram of Roberts-Austen and Bakhuis Roozeboom (this vol., ii, 717), fused iron containing less than 4·3 per cent. of carbon is supposed to deposit iron-carbon mixed crystals; with more than 4·3 per cent. of carbon, graphite is deposited, the eutectic (mixed crystals and graphite) lying at 4·3 per cent. carbon and about 1100°. But since the solid iron does not contain any graphite, it is assumed by Bakhuis Roozeboom that below 1100° the mixed crystals react with graphite to produce carbide (cementite). The author points out that this view cannot be reconciled with the well-established fact that white cast-iron is obtained by rapid cooling, whilst slow cooling produces grey cast-iron, and, further, that when white cast-iron is heated graphite is set at liberty. The author suggests that the graphite is probably the constituent which corresponds with the condition of stable equilibrium, but, in consequence of super-cooling, the fused iron may readily cool below the temperature at which graphite should crystallise out and reach the somewhat lower temperature at which carbide crystallises. The carbide would then represent a metastable equilibrium which is reached only on account of a considerable retardation of the crystallisation of the graphite. This view is in accordance both with Roberts-Austen's experimental results and with metallurgical experience. Silicon diminishes the tendency to super-cooling, manganese increases it. T. E.

Properties and Constitution of Chromium Steels. Léon Guillet (*Compt. rend.*, 1904, 139, 426—428).—The connection between the micrographical properties and the composition of the chromium steels examined is shown in the following table:

Class.	Microstructure.	Steels containing 0·2 per cent. of carbon.	Steels containing 0·8 per cent. of carbon.
1	Perlite	0—7 per cent. of chromium	0—5 per cent. of chromium
2	Martensite or troostite	7—15 ,, ,,	5—10 ,, ,,
3	Martensite and carbide	15—20 ,, ,,	10—18 ,, ,,
4	Carbide	more than 20 ,, ,,	more than 18 ,, ,,

In respect of their mechanical properties, the steels containing the double carbide are too brittle for industrial purposes, whilst of all the martensite steels so far examined (compare Abstr., 1903, ii, 297, 650, 730; this vol., ii, 266) those containing chromium are the hardest.

The chief mechanical properties of the chromium steels are tabulated in the original. M. A. W.

Constitution and Properties of Tungsten Steels. Léon Guillet (*Compt. rend.*, 1904, 139, 519—521).—Tungsten steels, containing 0·2 per cent. of carbon, show perlite or carbide structure according as the percentage of tungsten is less or greater than ten. In the case of steels containing 0·8 per cent. of carbon, the change in structure appears with 5 per cent. of tungsten. The breaking weight of the perlitic steels increases with the amount of tungsten present, that of the carbide steels decreases. The hardness and fragility of both classes are not much altered by the contained tungsten. Tempering transforms the carbide steels into martensite steels, but carbide is also found after tempering, if much tungsten is present. Certain steels (0·8 per cent. C, > 2 per cent. W). can be tempered by air-cooling. H. M. D.

Properties and Constitution of Molybdenum Steels. Léon Guillet (*Compt. rend.*, 1904, 139, 540—542).—Molybdenum steels, containing about 0·2 per cent. of carbon, exhibit perlite or carbide structure according as the molybdenum is present in quantity less or greater than 2 per cent. In the case of steels containing about 0·85 per cent. of carbon, the transition from perlite to carbide structure takes place at 1 per cent. of molybdenum. The influence of molybdenum on the properties of the steels is quite similar to that of tungsten (preceding abstract), but larger quantities of the former are required to produce the same effect. H. M. D.

Action of Arsenious Acid on Freshly-precipitated Iron Hydroxide. Wilhelm Biltz (*Ber.*, 1904, **37**, 3138—3150).—Solutions of arsenious acid, containing some potassium chloride, were agitated at the temperature of the laboratory with freshly-precipitated ferric hydroxide and the amount of arsenious acid removed from the solution by the hydrogel determined by titration with standard iodine solution. From the results quoted, it appears that the action of ferric hydroxide as an antidote in arsenical poisoning is due neither to the formation of a basic ferric acetate nor to the formation of a solid solution, but to absorption.

Experiments were conducted with solutions both of vitreous and of crystalline arsenious oxide. The distribution of arsenious acid between water and ferric hydroxide was also measured at 100°. The reversibility of the action was examined by first allowing the equilibrium to be established between the solution of arsenious acid and ferric hydroxide, then separating the liquid in contact with the solid and replacing it by water; the mixture was then agitated for several hours until equilibrium was again attained and the amount of arsenious acid in the liquid estimated as before.

The absorption property of the iron hydrosol during its formation from the hydrosol, obtained by the dialysis of ferric nitrate, was also examined.

Silicic acid and aluminium hydroxide show very slight absorption properties.

The action of antitoxins on the toxins of blood serum is discussed.

A. McK.

Oxidation of Solutions of Ferrous Salts. Eduard Jordis [with Hubert Vierling] (*Zeit. Elektrochem.*, 1904, **10**, 679—682).—Samples of ferrous ammonium sulphate crystallised in large and small crystals and precipitated with alcohol show considerable differences in their conductivity in aqueous solution. The last sample contained 0·153 per cent. of alcohol. There are also small differences in the composition of the samples.

The oxidation of solutions of ferrous salts by air is accelerated by platinum and by small quantities of sulphuric acid. The precipitate which forms in presence of platinum is yellow, it contains 20 equivalents of ferric iron to one equivalent of SO_4, and is insoluble in cold acids. That formed without platinum is red, contains 16·89 equivalents of iron to one of SO_4, and dissolves readily in cold acids. A large number of measurements of electrode potentials in more or less oxidised ferrous salt solutions have been made, but the details are not given. T. E.

Cobalt Chloride. William Oechsner de Coninck (*Bull. Akad. Roy. Belg.*, 1904, 6, 803—805).—Anhydrous ethylene glycol dissolves 10·6 per cent. of cobalt chloride hexahydrate at 16·4°, giving a violet-purple solution, which becomes dark blue on heating. Anhydrous cobalt chloride is obtained on distilling this solution under reduced pressure; in a moist atmosphere, it takes up water again, forming first the di- and then the tetrahydrate. E. F. A.

Action of Potassium Nitrite on Nickel Salts. II. III. C. Reichard (*Chem. Zeit.*, 1904, 28, 885—886, 912).—Further particulars of the various double compounds are given (this vol., ii, 488). The formula for the barium compound is

$$2Ni(NO_2)_2Ba(NO_2)_2,2KNO_2,$$

and the calcium and strontium compounds have a corresponding composition. L. de K.

Titanium and Tin Compounds. Friedrich Emich (*Monatsh.*, 1904, 25, 907—912. Compare Ruff and Plato, this vol., ii, 265).—Barium titanifluoride, $BaTiF_6,\frac{1}{2}H_2O$, is obtained as a coarse, crystalline precipitate when barium chloride is added to a hot aqueous solution of potassium titanifluoride; it loses water of crystallisation only on prolonged heating at a dull red heat; when heated more highly, it decomposes with formation of titanium tetrafluoride, which has the properties previously described (*loc. cit.*).

Titanium tetrachloride solidifies at −23°; stannic iodide boils at 341° (corr.).

Potassium stannifluoride, K_2SnF_6,H_2O, is formed as a crystalline precipitate when stannic chloride is treated with potassium fluoride in warm water; with concentrated sulphuric acid, it evolves hydrogen fluoride.

Barium stannifluoride, $BaSnF_6,3H_2O$, obtained in the same manner, crystallises in glistening leaflets, and yields hydrogen fluoride when treated with concentrated sulphuric acid. G. Y.

Preparation of Homogeneous Products from Tantalum and other Difficultly Fusible Metals. Siemens & Halske, Akt.-Ges. (D.R.-P. 152848, 152870, and 153826).—Tantalum and other difficultly fusible metals may be fused by means of an electric current, the powdered metal being previously compressed to form rods. The operation is carried out under reduced pressure, an atmosphere of nitrogen or hydrogen not being admissible. In order to prevent the volatilisation of the tantalum, the compressed rod is best made the positive electrode, a comparatively large metallic negative electrode being used, cooled to a temperature only slightly above the melting point of tantalum. Or the cooling surface may be brought into the neighbourhood of the electrodes without being connected with them, but the former plan requires a smaller expenditure of energy.

C. H. D.

Preparation of Colloidal Metals. Nicola Castoro (*Zeit. anorg. Chem.*, 1904, **41**, 126—131).—When acraldehyde is added to a hot and faintly alkaline solution of gold chloride, the gold hydrosol is formed, exhibiting colorations, sky-blue, amethyst, violet, pink, or purple, varying with the particular dilution. A gold mirror may be obtained under suitable conditions. When a 1 per cent. solution of gold chloride is heated with 1 c.c. of allyl alcohol, a faintly violet coloration is first produced, which changes to a ruby-red. Such concentrated solutions of gold hydrosol do not deposit gold after being dialysed during ten days.

The hydrosols of platinum, palladium, osmium, and ruthenium may also be prepared from the chlorides of the metals by means of acraldehyde.

A. McK.

Densities of Alloys of Gold and Copper and of Gold and Silver. Copius Hoitsema (*Zeit. anorg. Chem.*, 1904, **41**, 63—67).—The following values were obtained with alloys of gold and copper:

Gold in 0/00.	Sp. gr. at 15°.	Specific volume.
(1000)	(19·26)	(0·05192)
917	17·35	0·05764
833	15·86	0·06305
750	14·74	0·06784
583	12·69	0·07880
250	10·035	0·09965
0	(8·7)	(0·11494)

With alloys of gold and silver the results were:

Gold in 0/00.	Sp. gr. at 15°.	Specific volume.
(1000)	(19·26)	(0·05192)
917	18·08	0·05531
843	16·96	0·05896
750	16·03	0·06238
667	15·07	0·06636
583	14·24	0·07023
500	13·60	0·07353
417	13·00	0·07692
333	12·38	0·08070
250	11·78	0·08489
167	11·28	0·08861
0	(10·4)	(0·09569)

A. McK.

Analysis of Margules' Platinum Sulphate. Leo Stuchlik (*Ber.*, 1904, **37**, 2913—2915).—The solution of platinum in sulphuric acid of sp. gr. 1·840, obtained by Margules (Abstr., 1898, ii, 497) by means of an alternating current, deposits yellow crystals, which retain free sulphuric acid even after several crystallisations from water. By repeated crystallisation from water in a vacuum, large, orange leaflets of $Pt(SO_4)_2,4H_2O$ are obtained. The salt loses water in a desiccator, becoming darker in colour. The anhydrous salt shows green metallic reflex. The salt containing sulphuric acid is stable, losing little in weight at 100° and remaining orange in colour. Both salts dissolve readily in water, the hydrated salt to a yellow and the anhydrous salt to a dark solution. The yellow solution deposits a brown, basic salt on warming (compare Ruer, Abstr., 1903, ii, 407). Sulphuric acid precipitates yellow crystals, apparently of the hydrated salt, from the dark solution. C. H. D.

Mineralogical Chemistry.

Radioactive Cinnabar. Sima M. Losanitsch (*Ber.*, 1904, **37**, 2904—2906).—Specimens of cinnabar from Avala and Bare in Servia, and Idria in Austria, were found to be radioactive, although much less so than pitchblende. Other mercury minerals examined were inactive. The barytes which accompanies the active cinnabar is inactive, from which it is concluded that radium is absent and that the activity is due to a "radio-mercury." The activity is completely removed by igniting the mineral. C. H. D.

Cobaltiferous Mispickel from Norway. Mark Fletcher (*Min. Mag.*, 1904, **14**, 54—55).—The axial ratios ($a:b:c=0\cdot6886:1:1\cdot1915$) of some crystals from the Sulitjelma mines in Arctic Norway suggested glaucodote, but the following analysis, by J. A. Smythe, points to a mispickel approaching in composition to the danaite variety.

S.	As.	Fe.	Co.	Total.	Sp. gr.
21·86	42·18	35·31	1·15	100·50	5·94—6·02

L. J. S.

Teallite, a New Sulphostannite from Bolivia; and its Relations to Franckeite and Cylindrite. George T. Prior (*Min. Mag.*, 1904, **14**, 21—27).—The new mineral occurs as thin graphite-like folia in association with kaolin, pyrites, wurtzite, and galena. The folia have a greyish-black colour with metallic lustre; their outline is nearly square, and there is a perfect basal cleavage; orthorhombic [$a:b:c=0\cdot93:1:1\cdot31$]. Sp. gr. 6·36; hardness 1—2. The mean (I) of two analyses gives the formula $PbSnS_2$.

	Pb.	Fe.	Zn.	Ag.	Sn.	Sb.	S.	Total.	Sp. gr.
I.	52·98	0·20	—	—	30·39	—	16·29	99·86	6·36
II.	46·23	2·69	0·57	0·97	17·05	11·56	21·12	100·19	5·88
III.	48·02	2·74	—	0·99	13·89	13·06	20·82	99·52	5·92
IV.	35·24	2·81	—	0·50	25·65	12·31	23·83	100·34	5·46
V.	34·58	2·77	—	0·28	25·10	12·98	23·88	99·59	5·49

In physical characters, teallite is very similar to franckeite and cylindrite, each of which has been analysed only once previously. Analyses II and III are of frankeite from Poopó, Bolivia; II being of material crystallised in square (probably tetragonal) folia, and III of more massive material; formula, $Pb_5FeSn_3Sb_2S_{14} = 3PbSnS_2 + Pb_2FeSb_2S_8$. New analyses of cylindrite, also from Poopó, are given under IV and V; formula, $Pb_3FeSn_4Sb_2S_{14} = 3PbSnS_2 + SnFeSb_2S_8$.

L. J. S.

Bog-iron Ore. D. INGERMAN (*Chem. Centr.*, 1904, ii, 842; from *Pharm. Weekblad.*, **41**, 486—488).—The results obtained in estimating the quantity of phosphorus in some samples of bog-iron ore from North Brabant, by dissolving in hydrochloric acid and subsequently precipitating with molybdate, were found to be different from those obtained by heating the substance with sodium carbonate and potassium nitrate and then precipitating with molybdate. It must be assumed therefore that a portion of the phosphorus contained in the ore is combined with iron, possibly in the form of the phosphide Fe_4P_2.

E. W. W.

Dolomites of Eastern Iowa. NICHOLAS KNIGHT (*Geol. Mag.*, 1904, 493—495).—Analysis, by G. D. Bradshaw, of a dolomite rock used as a building stone gave the following results. The silica is present as quartz-sand, and there is an absence of ferrous oxide.

$CaCO_3$.	$MgCO_3$.	SiO_2.	Al_2O_3.	Fe_2O_3.	Total.
53·62	44·96	0·83	0·25	0·34	100·00

L. J. S.

Triplite and Tourmaline from Östergötland. AXEL HAMBERG (*Geol. Fören. i Stockholm Förhandl.*, 1904, **26**, 77—80).—In a large pegmatite-vein traversing gneiss at Skrumpetorp, in Godegård parish, there are gigantic crystals of tourmaline, measuring 2—3 metres in length and 3 m. in thickness. Associated with these is dark brown, massive triplite, analysis of which, by Naima Sahlbom, gave the following results. Deducting some water and ferric oxide as being due to the presence of enclosed limonite, this analysis agrees with the usual formula, $R_2''PO_4(F,HO)$. Thin veins in the triplite contain vivianite as an alteration product.

Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	K_2O.	Na_2O.	H_2O.	F.	P_2O_5.	SiO_2.	Total, less O for F.
2·16	3·40	20·48	32·60	0·80	1·33	0·33	0·98	1·25	6·96	32·33	0·11	99·80

L. J. S.

Occurrence of Thorium in Ceylon. WYNDHAM R. DUNSTAN (*Nature*, 1904, **69**, 510).—A black cubic mineral from the gem washings near Balangoda, in the Sabaragamuwa province, was found to contain much more thorium than any previously known mineral, and for it the name *thorianite* is proposed. Analyses by G. S. Blake gave the results under I and II.

	ThO_2.	CeO_2.	La_2O_3. Di_2O_3.	ZrO_2.	UO_3.	Fe_2O_3.	PbO.	SiO_2.	Insol.	Total.	Sp. gr.
I.	76·22	8·04		trace	12·33	0·35	2·87	0·12	—	99·93	9·32
II.	72·24	6·39	0·51	3·68	11·19	1·92	2·25	1·34	0·41	99·93	8·98
III.	66·26	7·18	—	2·23	0·46	1·71	—	14·10	—	99·89*	4·98

* Also: CaO, 0·35; P_2O_5, 1·20; H_2O, 6·40.

Associated with the thorianite is a pale brown mineral, which on a fresh fracture is purplish-brown with a resinous lustre; this is shown by analysis III to be thorite.

Sir William Ramsay (*ibid.*, 69, 533, 559).—The new mineral contains helium (9·5 c.c. per gram.), and a trace only of radium. The high atomic weight (about 240) of the elements precipitated as oxalates and soluble in excess of ammonium oxalate suggests other elements allied to thorium, to the presence of which the high radio-activity is no doubt due. L. J. S.

[Ceylonese Minerals.] Ananda K. Coomára-Swámy (*Spolia Zeylanica*, 1904, 2, 57—64).—Particulars of the mode of occurrence and localities of thorianite (compare preceding abstract) are given. Notes are added respecting various other Ceylonese minerals, of which the following have been analysed. I, phlogopite from Ampitiya, near Kandy; almost colourless, six-sided crystals, not exceeding four inches across. II, moonstone from Gangapitiya, Central Province; clear and colourless, and free from inclusions. III, kaolin from Alutwela, Central Province; a yellowish-pink clay.

	SiO_2.	Al_2O_3.	Fe_2O_3.	MgO.	K_2O.	Na_2O.	H_2O (combined).	Moisture.	Total.
I.	39·39	17·88	0·21	25·86	9·90	1·09	3·62	0·82	98·79
II.	65·70	19·85	0·17	—	8·04	5·20	0·28	0·10	99·34
III.	43·56	34·77	3·40	—	0·28	0·36	11·90	5·63	99·90

L. J. S.

Pseudo-cubic Antigorite from Sweden. Axel Hamberg (*Geol. Fören. i Stockholm Förhandl.*, 1904, 26, 67—76).—Associated with magnetite, chlorite, and calcite at Persberg are irregularly shaped masses of a greenish-white mineral with the composition of serpentine ($H_4Mg_3Si_2O_9$; anal. I, by Elsa Cronqvist), which is remarkable in possessing perfect cleavages, with pearly lustre, in three directions at right angles to each other. Through all three cleavages are seen biaxial optic figures, negative in sign. The same mineral also occurs in the Ko mine at Nordmarken (anal. II).

	SiO_2.	Al_2O_3.	MgO.	FeO.	MnO.	Alkalis.	H_2O.	F.	Total.
I.	43·68	0·34	38·94	4·18	trace	trace	12·03	—	99·17
II.	42·90	0·51	39·19	3·90	trace	trace	12·30	0·97	99·77

The mineral is very similar to that first described by J. D. Dana (1874) from the Tilly Foster mine, New York, which has been considered to be a pseudomorph of serpentine after periclase. The Swedish mineral is, however, explained as a pseudo-cubic aggregate of antigorite lamellæ. L. J. S.

[Nephrite from Brazil.] EUGEN HUSSAK (*Ann. naturhist. Hofmus. Wien*, 1904, 19, 85—95).—Worked articles of nephrite accompanied by rough material have been recently found in excavations of ancient Indian tumuli near Baytinga, in southern Bahia. The material varies in colour from dark green to white, and in structure from granular to finely fibrous. Analyses I and II are of pale green and of white material respectively. Microscopical examination shows that there is a passage from the granular material to that with a fibrous structure, and that the latter is in turn altered to a steatitic mineral: the view is expressed that nephrite is a fibrous hornblende of secondary origin.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	CaO.	MgO.	P_2O_5.	H_2O.	Total.
I.	54·76	4·08	—	1·80	14·31	21·26	0·40	3·72	100·33
II.	57·51	3·11	trace	—	14·65	21·80	—	3·39	100·46

The paper also gives a description of the meteoric stone which fell in 1903 near Uberaba, in Minas Geraes, and of the mineral hamlinite from the diamantiferous sands of Diamantina L. J. S.

Physiological Chemistry.

Diminution of Carbon Dioxide in the Pulmonary Alveoli of Man on returning from Rarefied Air to the Normal Barometric Pressure. A. AGGAZZOTTI (*Atti R. Accad. Lincei*, 1904, [v], 13, ii, 208—215).—The author finds that the volume of air breathed by a man returning from the rarefied air on a mountain (Monte Rosa) to the plain is less than the normal amount, and further, that a less quantity of carbon dioxide is expired, since analysis of the air in the pulmonary alveoli shows an abnormally small proportion of carbon dioxide, although the ventilation of the lungs is less intense.

T. H. P.

Influence of the Barometric Pressure on the Partial Pressures of the Carbon Dioxide and Oxygen in the Pulmonary Alveoli. A. AGGAZZOTTI (*Atti R. Accad. Lincei*, 1904, [v], 13, ii, 224—232).—The experiments described show that diminution of the barometric pressure causes an increase in the proportion of carbon dioxide present in the air of the pulmonary alveoli. This increase does not depend on lessening of the ventilation, since barometric depression causes the pulmonary ventilation to become greater than the normal. The partial pressure of the carbon dioxide of the reserve air during the rarefaction is always less than the normal, even when its respiration is greatest; it presents oscillations depending on the quantity of carbon dioxide respired in the different degrees of rarefaction. The partial pressure of the oxygen gradually diminishes as the rarefaction of the air proceeds, but the diminution is most rapid between 650 mm. and 450 mm., because within these limits the greatest consumption of oxygen takes place as a result of the barometric depression. T. H. P.

Influence of Inanition and Removal of Blood on the Composition of Blood-plasma. THOS. ST. GITHENS (*Beitr. chem. Physiol. Path.*, 1904, 5, 515—523).—In inanition, the globulin fractions of the blood proteids increase. Removal of blood causes a lessening of the fibrinogen and an increase in the albumin; the figures relating to the serum globulins are inconstant. Probably fibrinogen and albumin have different origins; the globulins do not appear to originate from the albumin. The number of experiments recorded is small. W. D. H.

Proteolytic Ferment in Leucæmic Blood. O. SCHUMM (*Beitr. chem. Physiol. Path.*, 1904, 5, 583).—The products of the action of this ferment are albumoses, peptone, leucine, tyrosine, lysine, ammonia, and tryptophan. W. D. H.

Blood Coagulation. LEO LOEB (*Beitr. chem. Physiol. Path.*, 1904, 5, 534—557. Compare Abstr., 1904, ii, 496).—Experiments on the favouring action which tissue extracts have on the coagulation of blood; these were mainly conducted with fluoride plasma and peptone plasma. The question as to how these substances (coagulins) act is discussed. W. D. H.

Leucocytes and Blood Clotting. FRIEDRICH KRÜGER (*Chem. Centr.*, 1904, ii, 664; from *Arch. exp. Path. Pharm.*, 51, 325—340).—Largely polemical against Ruechel and Spitta, who deny that leucocytes break down during the coagulation of blood. In the blood of cats and dogs it is the polymorpho-nuclear cells which mainly break down. W. D. H.

Ether-laking. S. PESKIND (*Amer. J. Physiol.*, 1904, 12, 184—206).—The experiments are in favour of the hypothesis that the cause of ether-laking is the solution and extraction of lecithin and cholesterol from the envelopes of the blood-corpuscles. The same percentage of ether brings about laking as is necessary to dissolve lecithin and cholesterol. The weak point of the theory appears to be that ether (or chloroform) which is saturated with cholesterol, lakes blood just as though no cholesterol were dissolved in it. W. D. H.

Influence of Cathions on the Coagulability of the Blood. GIUSEPPE BUGLIA (*Atti R. Accad. Torino*, 1903—1904, 39, 921—956).—Of a large number of salts examined by the author, all except two (mercuric chloride and silver nitrate) are capable of rendering blood non-coagulable. The proportions of the various salts required to effect this change vary very considerably, and the intensity of the anti-coagulating action is closely related to the chemical nature of the metal in the salt; the most active salts in this direction are those of the heavy metals, less active are those of the alkaline-earth metals, whilst salts of the alkali metals are only very slightly active.

Further, with most, but not all salts, it is possible to restore the coagulability of the blood by various means. The salts are hence divisible into two groups: (1) this comprises salts which only prevent blood from coagulating when in moderately large doses, which produce no profound change in the physical aspect of the blood, and can have their action annulled by the addition of physiological or chemical solutions of serum. (2) In this group are those salts which, in very small doses, prevent the coagulation, which produce in the blood changes visible macroscopically (formation of white floccules), and the action of which is destroyed neither by dilution, nor by precipitants, nor by the addition of serum.

The anti-coagulating power of salts only comes into action for a certain minimum or critical molecular concentration, and when this is exceeded the blood remains persistently liquid.

In determining the anti-coagulating power of a salt, in some cases the cathion is very active and the anion only slightly so, whilst in others it is the anion which is the more active. T. H. P.

Fate of Salt Solutions in the Human Stomach. Casimir von Rzentkowski (*Chem. Centr.*, 1904, ii, 719—720; from *Arch. exp. Path. Pharm.*, 51, 289—309).—The experiments were made on a boy sixteen years old on whom, on account of the complete obstruction of the œsophagus, the result of poisoning by alkali, the operation of gastrostomy had been performed. Nutriment was supplied exclusively from the opening in the abdomen. When a hypertonic solution containing 5·85 per cent. of sodium chloride was introduced, it was found that it became strongly diluted in the stomach, so that the work of the intestine was facilitated, but the solution did not become isotonic with the blood. The rapidity with which sodium chloride solutions left the stomach was to a certain extent dependent on the concentration. In the case of pure water, 7 c.c. disappeared in a minute, but a normal solution of sodium chloride required three times as long. Slightly hypotonic solutions of sodium chloride and pure water cause irritation of the stomach and induce secretion, the concentration being thereby increased. This occurs the more rapidly the less the concentration of the sodium chloride solution. The increase of concentration is not caused by the separation of hydrochloric acid, since this acid could not be detected in the contents of the stomach. When hypotonic solutions of solvents such as egg and water, or milk, egg, and water were administered, the contents of the stomach soon became isotonic with the blood owing mainly to the separation of hydrochloric acid. Opium caused the dilution of hypertonic solutions to take place with twice the normal rapidity. E. W. W.

The Proteolytic and Rennet-like Action of Different Digestive Juices. J. P. Pawloff and S. W. Parastschuk (*Zeit. physiol. Chem.*, 1904, 42, 415—431).—The two actions of various digestive juices (gastric, pancreatic, intestinal) in producing milk coagulation and proteolysis run parallel. Pancreatic juice does not clot milk until it is activated. The experiments lend support to the view that the two actions are not due to different ferments. W. D. H.

Solubility of Milk and Casein in Pepsin-hydrochloric Acid. Arthur Zaitschek and F. von Szontagh (*Pflüger's Archiv*, 1904, **104**, 550—563).—Digestion experiments with pepsin-hydrochloric acid show that the milk and casein of woman, ass, and mare are entirely digested; whereas those of the cow, buffalo, and goat are not. The latter kinds of milk yield a larger amount of pseudo-nuclein than the casein prepared from them does. The milks of the first class contain less casein and a relatively smaller part of the total nitrogen in the casein than those of the second. The addition of thymol, toluene, and chloroform hinder digestibility, so also does drying the casein at 110°. W. D. H.

Artificial Digestion of some Compounds of Casein and Paracasein contained in Cottage and Cheddar Cheese. Lucius L. Van Slyke and Edwin B. Hart (*Amer. Chem. J.*, 1904, 32, 154—164). —It is popularly believed that fresh cottage or Dutch cheese, which consists essentially of casein dilactate with 70—75 per cent. of moisture, is more easily digested than new Cheddar cheese, in which the nitrogen is present mainly as paracasein monolactate. In order to test this view, experiments have been carried out on the action of pepsin, in presence and absence of hydrochloric acid, on paracasein, paracasein monolactate and dilactate, and casein monolactate, dilactate, and dihydrochloride. The results show that in the absence of acids paracasein is not digested, whilst the other compounds undergo partial digestion, the monolactates of paracasein and casein being digested to a greater extent than the corresponding dilactates. In the presence of 0·4 per cent. of hydrochloric acid, paracasein dilactate is more readily digested than the monolactate; paracasein mono- and di-lactates and casein mono- and di-lactates and dihydrochloride digest more completely in the presence of hydrochloric acid than in its absence. The addition of acid after digestion has commenced causes a larger quantity of proteid to be digested both in cottage and Cheddar cheese. Casein dilactate and dihydrochloride are digested by pepsin at the same rate and to the same extent. Cottage cheese made from whole milk is digested more quickly than that made from skim-milk owing to the looser texture of the former; the fat present does not retard digestion. The digestibility of cottage cheese is greater than that of Cheddar cheese owing to the fact that in presence of hydrochloric acid casein dilactate is more easily digested than paracasein monolactate, and also because cottage cheese, as ordinarily consumed, is in a finer state of division than Cheddar cheese, and is therefore more readily attacked by digestive agents. E. G.

Feeding Experiments with Hydrolysed Casein. Emil Abderhalden and Peter Rona (*Zeit. physiol. Chem.*, 1904, 42, 528—539). — The simple cleavage products (polypeptides, &c.) of casein, obtained by the use of pancreatin, pepsin-hydrochloric acid, and acids, were administered to mice. The animals maintained their weight and health, and the experiments furnish additional proof of the synthesis of the proteids of the body from simple substances. W. D. H.

Digestibility of Chitin and the Nutritive Value of Insects. ARTHUR ZAITSCHEK (*Pflüger's Archiv*, 1904, **104**, 612—623).—The experiments were made on birds to the food of which the insect *Palingenia longicauda* was added. It was found that chitin was wholly undigested, but the remainder of the insect forms a source of considerable energy. The experiments were given with full details, energy as usual being reckoned in calories. W. D. H.

How does an Excess of Calcium Carbonate in Food affect the Utilisation of the Food Constituents? JAKOB VOLHARD (*Landw. Versuchs-Stat.*, 1904, **61**, 305—312).—The results of experiments in which two sheep were each fed for 18 days with meadow hay (700 grams), cotton-seed meal (200 grams), sodium chloride (10 grams), and calcium carbonate (50 grams) per day, showed that the calcium carbonate had no appreciable effect on the assimilation of the food. The fæces contained more than 6 per cent. of calcium carbonate in the dry matter.

Weiske (*J. Landw.*, 1885, **33**, 21) showed that addition of sulphuric acid to hay ($SO_3 = 7{\cdot}5$ grams per kilo.) did not interfere with the digestion of sheep. N. H. J. M.

Effect of Food Fat and some other Food Constituents on the Production of Milk. AUGUST MORGEN, CARL BEGER, GUSTAV FINGERLING, PAUL DOLL, ERWIN HANCKE, HERMAN SIEGLIN, and WILLY ZIELSTORFF (*Landw. Versuchs-Stat.*, 1904, **61**, 1—284. Compare Abstr., 1902, ii, 107).—The experiments were made with sheep (1900—1903) and with goats (1901—1903).

Food almost free from fat maintained the animals in a healthy condition and increased the live weight, but it is unsuitable to milk production. Addition of digestible proteids in the place of corresponding amounts of carbohydrates was favourable to milk production, but was without effect on the percentage of fat in the dry matter. Food fat (0·5—1 gram per kilogram of live weight) promotes the production of milk fat; a larger amount of food fat is sometimes favourable and sometimes unfavourable, but generally is without further effect.

Addition of oil to food raises the iodine and refractometer numbers of the milk fat, but no other changes in the nature of the milk fat were observed; and earth nut oil and mutton tallow gave almost identical results.

Whilst food fat is especially suitable for the production of milk fat, it is only of secondary importance as a maintenance food. Carbohydrates cannot take the place of food fat. The employment of stimulants is only desirable in special cases. N. H. J. M.

The Tissues as Water-reservoirs. W. ENGELS (*Chem. Centr.*, 1904, ii, 665; from *Arch. exp. Path. Pharm.*, **51**, 346—360).—Dogs were allowed to fast for 4 days, and their tissues were then freed from blood; the amount of water in the animals comprised 66 per cent. of their weight. 42·8 of the body consists of muscles, and contains 47·7 per cent. of the water of the body; 16·1 consists of skin containing 11·6 per cent. of the water; the rest of the body (41 per cent.) contains the rest of the water (40·7 per cent.). By injection of 0·6 per cent. solution of sodium chloride intravenously, the muscles and skin take up most water; the muscles take up 67·9 per cent. of the water added to the body, and are therefore the most important from the point of view of water-reservoirs. W. D. H.

Amount of Calcium in Various Animal Organs. M. Toyonaga (*Bul. Coll. Agr. Tōkyō,* 1904, **6**, 89—95).—Smooth and striped muscles (horse) contained respectively 0·050 and 0·046 calcium per thousand, the relations Ca : Mg being 0·24 : 1 and 0·29 : 1. The amount of calcium in the testicles of horses and bulls is less than in the pancreas, spleen, and liver, whilst the relation Ca : Mg is higher.

Determinations of calcium and magnesium were also made in the brains of calves and horses, and in the milk glands of cows. The results are summarised, together with those obtained by other investigators with various animal organs. N. H. J. M.

Taurine in Molluscan Muscle. Lafayette B. Mendel (*Beitr. chem. Physiol. Path.*, 1904, **5**, 582).—Taurine was separated from extracts of muscle and from the hepato-pancreas of various marine gasteropods. W. D. H.

Nucleo-proteid of the Liver. II. Julius Wohlgemuth (*Zeit. physiol. Chem.*, 1904, **42**, 519—523. Compare Abstr., 1903, ii, 440). —One hundred grams of nucleic acid from the nucleo-proteid of the liver yield 2·25 grams of xanthine, 2·54 of guanine, 1·9 of adenine, and 1·79 grams of hypoxanthine. In contrast with thymus-nucleic acid, the yield of guanine and xanthine is greater and of adenine less; the amount of hypoxanthine is about equal in the two cases.

W. D. H.

Ferments and Fatty Degeneration. Richard Waldvogel (*Zeit. physiol. Chem.*, 1904, **42**, 200—206).—During aseptic autolysis of the liver, the amounts of jecorin, protagon, fatty acids, cholesterol, and neutral fats increase; that of lecithin diminishes. Very similar results are obtained in livers of dogs poisoned with phosphorus, or by the addition of sterile liver extracts to lecithin. The change is attributed to ferment action, and is believed to be similar during autolysis and during fatty degeneration. W. D. H.

Absorption of Uric Acid and Sodium Urate. J. J. van Loghem (*Ann. Inst. Pasteur*, 1904, **18**, 468—480).—Freudweiler (*Deut. Archiv. Klin. Med.*, 1899, **63**, 266) states that uric acid crystals introduced under the skin of rabbits disappear by phagocytic action. This is not the case; they dissolve readily both *in vivo* and *in vitro* in the tissue juices. From such juices it is easy to obtain a precipitate of sodium urate like gouty tophi; this does not occur in normal tissues. If sodium urate is precipitated in the tissues or introduced there by injection, it disappears by phagocytic action, the phagocytes secreting in their protoplasm an acid which dissolves it. The bearing of these observations on theories of gout is discussed. W. D. H.

Uric Acid Formation in Tissue Extracts. Alfred Schittenhelm (*Zeit. physiol. Chem.*, 1904, **42**, 251—258).—Horbaczewski was the first to show the formation of uric acid from nuclein in spleen pulp. Adenine and guanine pass into uric acid almost quantitatively. The present paper gives experiments to show that the addition of sodium α-nucleinate to extracts of spleen, liver, and lung leads at 40—45° in three days (air being passed through the mixture and chloroform added as antiseptic) to the formation of uric acid; the amount found accounts for about two-thirds of the purine compounds originally present. The change is attributed to ferment action; the ferment is precipitable by ammonium sulphate, and is inhibited by alcohol. W. D. H.

Composition of Buffalo Milk. Richard Windisch (*Zeit. Nahr. Genussm.*, 1904, 8, 273—278).—The results of the analyses of samples of milk obtained from three buffalo cows are given. Both the morning and evening milk were analysed, about 42 samples in all being examined. The averages of the results were as follows:

	Morning milk.	Evening milk.
Total solids	20·12 per cent.	18·83 per cent.
Fat	9·20 ,,	7·87 ,,
Ash	0·775 ,,	0·831 ,,
Sp. gr. of milk ...	1·0310	1·0326
,, serum ...	1·0319	1·0325

W. P. S.

Fate of Strychnine in the Rabbit's Intestine. Robert A. Hatcher (*Amer. J. Physiol.*, 1904, **12**, 237—240).—The contents of the rabbit's cæcum and colon do not completely destroy strychnine under the conditions of the experiments described. It is doubtful whether any real destruction occurs under any conditions, in spite of Salant's statements to the contrary. W. D. H.

Freezing Point and Conductivity of Urine in Pharmacological Experiments. Heinrich Dreser (*Zeit. Elektrochem.*, 1904, **10**, 656—661).—The blood and other fluids in the bodies of warm-blooded animals have a freezing point which never differs much from $-0·56°$. Hence, in cases of dropsy the elimination of salt is as essential as that of water, since each gram of salt retains some 100 grams of water in the system. The author has found determinations of the freezing point and of the conductivity of the urine in such cases to be a very useful means of determining the total quantity of dissolved substance and of electrolytes in it. Among the usual diuretics, theocin produces a largely increased excretion of electrolytes, and is therefore capable of producing a permanent reduction in the quantities of water retained in the body, whilst the other diuretics only produce an increased elimination of water, which is reabsorbed at the first opportunity.

T. E.

Calorimetry of Urine. Koloman Farkas and Michael Korbuly (*Pflüger's Archiv*, 1904, **104**, 564—607).—Aqueous solutions of urea undergo a loss of energy by drying, but this is least when the drying is carried out in a vacuum at the ordinary temperature. The presence of hydrochloric acid does not hinder the loss of energy or of nitrogen. The loss of energy and of nitrogen are not parallel, and the proportion of the two is irregular. The same loss is noticeable on drying urine, especially at high temperatures and if the urine is alkaline. The use of Kellner's cellulose blocks is not recommended. Such facts show that the data given by Rubner and Krummacher in their investigations on metabolism need correction. W. D. H.

Urine of Herbivora. Ernst Salkowski (*Zeit. physiol. Chem.*, 1904, **42**, 213—250).—The principal points to which attention is drawn are: (1) The occurrence of allantoin as a frequent normal constituent of cow's urine; this substance crystallises out with calcium hippurate on evaporating the urine. The relation of allantoin to oxalic acid in metabolism is discussed. (2) The large amount of sulphuric acid in horse's urine which is excreted in combination with glycuronic acid. (3) The large amount of indican in the same urine, its origin in the body, and the methods for estimating it.

W. D. H.

Production of Sugar in the Kidney of the Dog under the Influence of Phloridzin. Raphael Lépine and Boulud (*Compt. rend.*, 1904, **139**, 497—499).—The observation that blood from the renal vein often contains more sugar than arterial blood is confirmed. Asphyxiation results in a considerable increase of sugar in the arterial blood, but not in the blood from the renal vein. From this it is deduced, that oxygen is necessary for the production of sugar from some other carbohydrate (sucre virtuel) (compare this vol., ii, 56). Both primary (immediate) and secondary (produced in one hour *in vitro*) sugars may be present in renal blood in excess of that in arterial blood. H. M. D.

Amino-acids in Urine. Emil Abderhalden and Lewellys F. Barker (*Zeit. physiol. Chem.*, 1904, **42**, 524—527).—If the naphthalene-β-sulphonic reaction is combined with Fischer's esterification method, amino-acids can be detected and separated in urine. The poisoning of dogs with phosphorus, glycine, leucine, and phenylalanine were thus detected. W. D. H.

Excretion of Uric Acid, administered in Various Ways to Rabbits. Ernst Bendix and Alfred Schittenhelm (*Zeit. physiol. Chem.*, 1904, **42**, 461—463).—After intravenous injection of uric acid (dissolved in piperazine solution), a large amount appears in the urine;

after administration by the mouth, only traces; after subcutaneous injection, an intermediate result is obtained. W. D. H.

Parent Substance of the Hippuric Acid produced in the Organism of Herbivorous Animals. THEODOR PFEIFFER, R. RIECKE, and C. BLOCH (*Bied. Centr.*, 1904, 33, 620—625; from *Mitt. landw. Inst. Univ. Breslau*, 2, *Heft*. 4).—The addition of readily digestible carbohydrates to a food which produces much hippuric acid causes a slight reduction in the amount formed, whilst an exclusive increase of digestible proteids slightly increases the amount of hippuric acid. Increasing the alkalinity of the urine by adding sodium acetate to the food has no effect.

As compared with gramineous hay, clover-hay contains only small amounts of the parent substance of hippuric acid. The substance present in meadow-hay is to a great extent soluble in hot water. Cherry-gum and coniferin produce hippuric acid, whilst pure arabinose does not. Crude fibre contains the parent substance, but in very varying amounts according to its origin. In the case of clover-hay, most of the hippuric acid is derived from the digestible crude fibre, whilst in the case of meadow-hay the crude fibre is relatively unimportant in this respect. N. H. J. M.

Origin and Precursors of Urinary Indican. FRANK P. UNDERHILL (*Amer. J. Physiol.*, 1904, 12, 176—183).—The quality as well as quantity of the nitrogenous constituents of food influences indican excretion. Gelatin causes a diminution of putrefactive products and reduces in dogs the amount of urinary indican. This may be of therapeutic value. W. D. H.

Urinary Proteid. KARL A. H. MÖRNER (*Beitr. chem. Physiol. Path.*, 1904, 5, 524—533).—Polemical against Oswald (this vol., ii., 358), who holds that the small amount of proteid in normal urine is a globulin. W. D. H.

The Resorcinol Reaction in Urine. RUDOLF ADLER and OSCAR ADLER (*Zeit. physiol. Chem.*, 1904, 42, 567).—Polemical against Rosin (this vol., ii, 595). W. D. H.

Ureine. H. D. HASKINS (*Amer. J. Physiol.*, 1904, 12, 162—166).—Moor's ureine is a mixture of several substances. It contains a large admixture of urochrome. The reactions which Moor believes establish the existence of ureine are in reality the characteristic reactions of urochrome. W. D. H.

New Toxin of the Urine. FRANCESCO MARINO-ZUCO (*Gazzetta*, 1904, 34, ii, 97—101).—By evaporating healthy human urine under rigorously aseptic conditions, the author has obtained a new toxin, which, when purified by precipitation with 90 per cent. alcohol and dialysis of its aqueous solution, is precipitated from the latter by a small quantity of sodium chloride as a white, amorphous powder insoluble in alcohol and perfectly odourless. The amount obtained is from

0·3 to 0·5 gram per litre of urine. It is unchanged in dry air, but in presence of moisture rapidly assumes a brown colour. Its activity diminishes gradually and is best maintained in the dark and in a perfectly dry atmosphere. When heated with sodium carbonate and potassium nitrate, it gives a residue yielding a precipitate with ammonium molybdate solution. It gives Liebermann's proteid reaction and the xantho-proteic reaction.

When injected into animals, it produces an almost immediate change of the temperature, which may rise to 41° and fall to below 30°. With large doses, death ensues in twelve hours; with very small doses, marked changes in temperature always supervene and the animals resist it for a month or more, but finally succumb in a comatose condition. Autopsy reveals a characteristic gelatinous œdema filtering in at the point of inoculation, and the medullary portion of the sub-renal capsule is either completely apoplectic, as in acute poisoning, or considerably congested, as in slow poisoning. This behaviour indicates that the toxin possesses enzymic properties. T. H. P.

Composition of Fæces during Different Diets. N. P. SCHIERBECK (*Arch. Hygiene*, 1904, 51, 62—95).—A very exhaustive examination of human fæces during different diets. In agreement with earlier researches by Prausnitz, it is found that the total nitrogen, ash, and ethereal extract have a constant relation to the total dry residue of the fæces in the same individual on an ordinary mixed diet. The same holds good for proteid nitrogen, cellulose, and pentosans. The amounts are independent of the amounts of these materials in the diet. The total nitrogen of the fæces is not, however, constant in different individuals on a mixed diet, and in some cases is higher on a diet of rye bread than in one which is presumably more completely absorbed. Attention is drawn to individual differences, and the cause of such is discussed. W. D. H.

The Action of Purgatives and their Inhibition by Calcium Salts. JOHN B. MACCALLUM (*Pfluger's Archiv*, 1904, 104, 421—432).—Experiments on rabbits and dogs were made with saline purgatives, cascara and rhubarb, and pilocarpine, all administered subcutaneously. Saline purgatives increase peristalsis and intestinal secretion; both are inhibited by calcium chloride and magnesium chloride. The action is independent of the connection of the intestine with the central nervous system. The same is true for the vegetable purgatives cascara and rhubarb. In the case of pilocarpine, the antagonism of calcium chloride is not so marked. W. D. H.

Inorganic Constituents of Tumours. S. P. BEEBE (*Amer. J. Physiol.*, 1904, 12, 167—172).—Analyses, mainly of the ash, in eight malignant and one benign tumour are given. Sulphur, phosphorus, nitrogen, iron, calcium, sodium, and potassium were determined. The results in some cases are very uniform, but the experiments are at present too few to enable definite conclusions to be drawn. W. D. H.

Effects of Certain Stimuli on Paramœcium. Elizabeth W. Towle (*Amer. J. Physiol.*, 1904, **12**, 220—236).—*Paramœcium* lives in pure water; it becomes readily habituated to solutions of various substances which are not rapidly fatal. Low temperatures cause loss of water and condensation of protoplasm; various chemical solutions containing predominant cathions act similarly, but secondary effects leading to swelling and liquefaction may follow. The actions of a number of substances are described, and also a certain amount of antagonism between different agents. W. D. H.

Importance of Sodium in the Functions of the Spinal Medulla. Silvestro Baglioni (*Atti R. Accad. Lincei*, 1904, [v], **13**, ii, 194—201).—On placing the isolated spinal medulla and the sciatic nerve of a frog in isotonic solutions of indifferent chemical substances (dextrose, sucrose, mannitol, glycerol, and asparagine) containing no trace of sodium salts, the reflex excitability of the centres and then the direct excitability of the peripheral nerve disappear in from 2 to 4 hours. If, however, these solutions contain in addition a small proportion of a sodium salt (0·2 per cent. of sodium chloride), the excitability persists. If the spinal medulla and the nerve, rendered inexcitable in the above manner, are placed for a short time ($\frac{1}{2}$ or $\frac{3}{4}$ hour) in the solution containing a sodium salt, they again acquire their full excitability; sodium chloride is the most active in this respect, then follow the hydrogen carbonate and nitrate. This revival is not produced by salts of metals allied to sodium, for instance, chloride of potassium or lithium. T. H. P.

Chloroform Anæsthesia. Victor Horsley and others (*British Med. J.*, 1904, ii, 720—729).—This is an account of an important discussion held at the recent meeting of the British Medical Association. Those who participated were the majority of British physiologists who have investigated the scientific bearings of the subject, and also the leading anæsthetists of the country. The principal practical point on which all agreed was that 2 per cent. of chloroform vapour in the air was all that is necessary, and beyond this danger lies. Speakers differed as to the form of apparatus by which this may be accomplished, those of Vernon Harcourt and of Dubois being more especially considered. W. D. H.

Influence of Chloroform on Intravital Staining with Methylene-blue. Christian A. Herter and A. N. Richards (*Amer. J. Physiol.*, 1904, **12**, 207—212).—Although the results found in rabbits were not uniform, there is evidence of diminished reduction on the part of chloroformed brains. The increased circulation of the dye in the blood is due to the impaired excretory activity of kidneys and liver. This explains a more abundant passage of the dye into the digestive tract, and the tint of the blood in part accounts for the appearance of the brain. The muscles, however, are less deeply stained than in the control animals. Ether acts similarly, except that the heart is less stained than in chloroformed animals, and less of the dye passes into the alimentary tract. W. D. H.

Employment of Reducible Pigments in the Study of Poisons. Christian A. Herter (*Zeit. physiol. Chem.*, 1904, **42**, 493—501).—The experiments were made on animals under the influence of various poisons, so as to test under these conditions the reducing action of the tissues on methylene-blue. The effect of narcosis is described in the preceding abstract. The results with hydrocyanic acid were variable, but the central nervous system is more deeply injured than other parts of the body. In poisoning by coal gas, many of the voluntary muscles are deeply pigmented with the methylene-blue; the same is true for the liver to a slight extent. It requires an almost fatal lessening of the oxygen of the blood to affect the reducing action of most tissues. A low body temperature lessens the action. In adrenaline poisoning, the kidneys are usually pale and secrete but little urine; the brain is bluer than in normal animals, and the suprarenals are deeply pigmented when the kidneys are inactive. W. D. H.

Physiological Action of Alcohol at Great Altitudes. Angelo Mosso and Gino Galeotti (*Atti Real. Accad. Lincei*, 1904, [v], **13**, ii, 3—12).—From experiments made on Galeotti, it is found that in the plains (in Turin) the ingestion of alcohol effects considerable changes in the organism, causing the temperature to rise, the respiration to become accelerated, and the proportion of carbon dioxide in the expired air to increase; on the summit of Monte Rosa, however, alcohol produces no change in the temperature or respiration, the only effect being that the carbon dioxide in the breath is augmented. It appears, then, that the sensitiveness of the nervous cells to the action of alcohol is diminished at great altitudes.

T. H. P.

Physiological Action of Carbocyclic Acids. Ernst Přibram (*Chem. Centr.*, 1904, ii, 668; from *Arch. exp. Path. Pharm.*, **51**, 372—382).—The sodium salts of the following acids given in various ways act as diuretics: benzoic, toluic, *p*-hydroxybenzoic, cinnamic, mandelic, protocatechuic, benzoylacetic, phthalic, gallic, hippuric, and camphoric. Some increase the urinary nitrogen; others do not. Phthalic acid is excreted quantitatively in the rabbit. W. D. H.

Alkyl Synthesis after Administration of Thiourea. Julius Pohl (*Chem. Centr.*, 1904, ii, 668; from *Arch. exper. Path. Pharm.*, **51**, 341—345).—If thiourea is given to dogs, cats, or rabbits by the mouth, under the skin, or by intravenous injection, the expired air contains an alkyl sulphide, probably ethyl sulphide (3 to 4 mg. in the 24 hours); the urine also contains abnormal odorous substances. Alkyl sulphide is also found in the muscles, and its occurrence is not prevented by extirpation of the kidneys. Ammonium thiocyanate, sodium sulphite, and sulphocarbanilide produce no such effect, but dimethylthiourea and thiosinamine do. W. D. H.

Fate of Potassium Myronate in the Animal Organism and its Hydrolysis by the Ferments of the Liver. JOSEPH H. KASTLE and ELOISE CHESLEY MCCAW (*Amer. Chem. J.*, 1904, 32, 372—376).—When potassium myronate is injected subcutaneously into animals, it passes unchanged into the urine and is not directly assimilable from the blood. If, however, the salt is administered by the mouth, it undergoes assimilation, probably through the agency of the liver. The action of aqueous extracts of the livers of various animals on potassium myronate has been investigated, and it is found that in all cases, except that of the fish, the liver contains a ferment capable of effecting the hydrolysis of the glucoside. The results seem to indicate that the hydrolysis of potassium myronate by animal myrosin takes place in two stages, in the first of which dextrose is liberated, whilst in the second the residue undergoes decomposition into allylthiocarbimide and potassium hydrogen sulphate. E. G.

Action of Muscarine and Pilocarpine on the Heart. H. MACLEAN (*Brit. Med. J.*, 1904, ii, 740).—There is an exact correspondence between the effects of electrical excitation of the inhibitory mechanism of the heart and those of muscarine and pilocarpine poisoning. These alkaloids act not on muscle directly, but on the inhibitory mechanism, and on the terminal parts of that mechanism not on ganglion cells. W. D. H.

Inhibition of the Action of Physostigmine by Calcium Chloride. SAMUEL H. MATTHEWS and ORVILLE H. BROWN (*Amer. J. Physiol.*, 1904, 12, 173—175).—The action of physostigmine in producing contractions of the intestine and tremors of voluntary muscles is counteracted by calcium chloride. The increased salivary secretion is partly counteracted. The experiments were made on dogs. W. D. H.

Hydrogen Cyanide and its Toxicological Detection. DOMENICO GANASSINI (*Chem. Centr.*, 1904, ii, 718—719; from *Boll. soc. med.-chir., Pavia.*).—Experiments on rabbits have shown that hydrogen cyanide is not a hæmatic poison in the strict sense of the term. It combines with the methæmoglobin of the blood, and in some cases, in which a large amount has been administered, the blood shows the reactions of cyanohæmoglobin after a few days, but, as a rule, hydrogen cyanide is not present in the blood, or at most in traces. Even when large quantities of the poison are taken, it cannot be detected in the brain, and when administered subcutaneously, or by the mucous membrane, neither the various fluids of the body nor the organs or tissues show the slightest trace of the acid except at the place where it was introduced into the organism. With the same rapidity with which it attacks the cells, especially those of the nervous system, it is converted into other substances, which are quickly eliminated, and for this reason a quantity merely necessary to cause death cannot be detected, but only the excess, which remains unchanged for a comparatively long time. In connection with Robert's colour tests with potassium ferricyanide and potassium chlorate, the following reactions are cited. When a few drops of a

1 per cent. alcoholic solution of guaiacum resin tincture are allowed to fall into blood which contains hydrogen cyanide, to which a few drops of a dilute solution of copper sulphate have been added, a more or less intense blue coloration is formed at the surface. By treating diluted blood with a grain of potassium percarbonate, a yellowish-green coloration is immediately formed if hydrogen cyanide is present. A preliminary test with Schönbein's paper rendered more sensitive by Brünnich's method has little practical value. The most suitable method of removing the hydrogen cyanide from the material to be examined is, in most cases, to distil after strongly acidifying with tartaric acid. Jacquemin's method of separating cyanides from ferro- and ferri-cyanides is not free from difficulties. Hydrogen cyanide is best detected in the distillate by means of the Prussian blue reaction, preferably by Vitali's method. Schauenstein's assumption that hydrogen cyanide is wholly or partly converted into ammonium formate in the organism can scarcely hold; the formation of uroxanthine compounds, xanthine, or monomethylxanthine is more probable. E. W. W.

Chemistry of Vegetable Physiology and Agriculture.

Chemical Changes in the Souring of Milk. Lucius L. Van Slyke and Edwin B. Hart (*Amer. Chem. J.*, 1904, 32, 145—154).—When milk turns sour, lactic acid is produced by fermentation of the lactose and the milk-casein becomes coagulated. Various explanations of the action which produces the coagulation have been proposed, but its nature has not yet been satisfactorily established.

Experiments have been carried out with the object of ascertaining the quantities of casein monolactate and dilactate formed in the souring of milk and the conditions under which lactose is converted into lactic acid. It has been found that at 18—27° the decomposition of the lactose takes place rapidly for 32 hours, then gradually diminishes, and ceases in 72—96 hours. The maximum loss of lactose amounts to 1·5 per cent., or about 28 per cent. of the sugar originally present in the milk; the lactic acid produced is about 0·9 per cent., which is equivalent to 62 per cent. of the lactose decomposed. The coagulation of the milk at 18—27° occurs in 24—29½ hours, the total acid present at this point being 0·6—0·7 per cent. When the coagulation of the milk is first apparent, 13—14 per cent. of the casein is in the form of monolactate and 86—87 per cent. in the form of dilactate, but as the quantity of acid increases, the monolactate is converted into the dilactate. E. G.

Mannitic Fermentation. Ulisse Gayon and Elisée Dubourg (*Ann. Inst. Pasteur*, 1904, 18, 385—386).—Mazé and Perrier have studied the production of mannitol by a microbe obtained from wine, and by means of a ferment previously isolated by the authors. They find neither glycerol nor succinic acid as products, and, further, they find alcohol in fermentations of lævulose and haricot broth. This is what the authors did not find; they have in consequence repeated their experiments under the conditions employed by Mazé and Perrier, but confirm their previous conclusions. W. D. H.

Dysentery Toxin and Antitoxin. CHARLES TODD (*J. Hygiene*, 1904, 4, 480—494).—Old cultures of *Bacillus dysenteriæ* (Kruse) in alkaline broth contain a soluble toxin. This is also contained in the bodies of the young bacilli. The horse and rabbit are susceptible, the guinea-pig, rat, and mouse resistant, to this toxin. Immunisation may be produced in the horse, and the antitoxic power of horse-serum so obtained reaches a high value; this may be used for preventive inoculation. The toxin and antitoxin neutralise each other *in vitro*, provided sufficient time is allowed. Shega's dysentery bacillus, and the bacillus of asylum dysentery in England, yield a similar toxin, which can be neutralised by the antitoxin prepared by means of Kruse's bacillus. Flexner's bacillus, and that of summer diarrhœa obtained from America, do not yield a soluble toxin. W. D. H.

Biochemistry of the Sorbose Bacterium. GABRIEL BERTRAND (*Ann. Chim. Phys.*, 1904, [viii], 3, 181—288).—A *résumé* of work already published (compare Abstr., 1896, ii, 494; 1898, i, 550, 556; ii, 397; 1899, ii, 44, 170; 1900, i, 377; 1902, ii, 159; Maquenne and Bertrand, Abstr., 1901, i, 497; and Sazerac, Abstr., 1903, ii, 606). M. A. W.

Some Constituents of Yeast. OSCAR HINSBERG and ERNST ROOS (*Zeit. physiol. Chem.*, 1904, 42, 189—192. Compare Abstr., 1903, ii, 565).—If an alcoholic extract of yeast is freed from alcohol and shaken with ether and excess of dilute sodium carbonate solution, the upper ethereal layer contains yeast fat, cholesterol, and the ethereal oil of lecithin; the lower layer contains peptonoids, xanthine bases, and small quantities of fatty acids. If dilute sodium hydroxide is used instead, the lower layer contains phosphorised materials, the result of lecithin decomposition; the ethereal layer is almost free from lecithin, and contains yeast fat, yeast oil, and cholesterol; the last traces of lecithin can be removed by again shaking with 1 per cent. sodium hydroxide solution. The melting points of the fatty acids obtained from the yeast fat were investigated; palmitic acid was identified, and another acid with higher melting point, but whether this is stearic acid or not is uncertain. W. D. H.

Respiration Coefficient of the Unicellular Alga, Chlorothecium Saccharophilum. LUDMILA PETRASCHEVSKY (*Chem. Centr.*, 1904, ii, 663—664; from *Ber. deut. bot. Ges.*, 22, 323—327).—Palladin showed that this alga is a typical aërobe, and its respiratory coefficient (CO_2/O_2) is less than unity. If brought into an atmosphere of hydrogen, it excretes carbon dioxide, but this soon ceases; it, however, recovers the property when air is once more admitted. In an atmosphere free from oxygen it decomposes complex compounds into simpler ones. A connection between respiratory and fermentative processes is suggested. In the present paper, it is shown that in raffinose the coefficient is greater than unity, and in mannitol smaller than normal; the explanation is that, by intramolecular respiration in an atmosphere free from oxygen, acids are formed in the former medium and alcohol-like substances in the latter. W. D. H.

Assimilation of Atmospheric Nitrogen by a Fungus found in Peat. Charlotte Ternetz (*Chem. Centr.*, 1904, ii, 461; from *Ber. deut. bot. Ges.*, 22, 267—274).—A fungus, "oxycoccus," which has the power of assimilating atmospheric nitrogen, has been found in peat and peaty soil, and has been isolated from the roots of various indigenous *Ericaceæ.* The fungus has a branched mycelium with septa, and forms brown pycnidia, which contain very small hyaline spores. The assimilation of nitrogen takes place under aërobic conditions of life, and does not cause fermentation of dextrose. The action of the fungus is not as rapid as that of *Clostridium Pastorianum*, but involves less waste. E. W. W.

Processes of Assimilation. Hans Euler (*Ber.*, 1904, 37, 3411—3418).—The author confirms Polacci's results (Abstr., 1900, ii, 160), obtained on distillation of leaves in a current of steam. The formaldehyde is probably liberated from its condensation products, during the distillation, as Polacci's results were obtained with dry hay, which could scarcely contain free formaldehyde.

On repeating Bach's experiments with uranium acetate (Abstr., 1893, ii, 483), it was found that the solution exposed to the action of sunlight alone gave in one hour the same precipitate of uranous and uranic hydroxides as was obtained in half an hour from the solution exposed to the action of sunlight and carbon dioxide. The function of the carbon dioxide is to remove oxygen from the solution, and it may be replaced by another indifferent gas, such as hydrogen or nitrogen.

In Bach's experiments with dimethylaniline (Abstr., 1903, ii, 484), no blue coloration is obtained if freshly purified dimethylaniline is used; with less pure dimethylaniline, the blue coloration is obtained from any one of the three solutions if it is insufficiently boiled and the filter insufficiently washed. G. Y.

Distribution of the Diastatic Enzymes of Green Malt. Rudolf Fürstl von Teichek (*Chem. Centr.*, 1904, ii, 375—376; from *Chem. Ind.*, 27, 270—275).—Examination of the diastase from the three portions of malt grain showed that the three products have approximately the same composition. The root diastase has only the dissolving power, whilst the other two both dissolve starch and produce sugar. The results confirm the theory that the twofold action of diastase is due to two ferments. N. H. J. M.

Changes of Proteids during Malting and Brewing. Fr. Weis (*Chem. Centr.*, 1904, ii, 373—374; from *Zeit. ges. Brauw.*, 27, 385—389, 405—407, 420—423, 440—445).—Proteolysis is considerable at comparatively low temperatures (4—20°), the optimum temperature being 51°, when the action is nearly twice as vigorous as at 35° and 60°. The conversion of albumoses into products which are not precipitated by tannic acid is considerably slower than the production of albumoses, and the optimum temperature is 45—50° (probably 47—48°); no action took place in two hours at 5° and very little at 15°.

Experiments on the action of malt extracts on mashes in presence of wheat gluten showed that the rapidity of the two processes (tryptic and peptic actions) vary greatly and that the proteolytic action is influenced by temperature and by alkalis and acids; it ceases in distinctly alkaline liquids, is very weak in neutral solutions, and is helped by acid phosphates. In practice the proteolytic changes in worts may be assisted by adding proteids of other origin.

When it is desired to obtain beer with as little nitrogen as possible without withholding from the worts the necessary amides, &c., addition of malt meal would seem to be suitable. N. H. J. M.

Effect of Sea-salt on Plants. Flora of the Salines at Cagliari. ANDREA SANNA (*Chem. Centr.*, 1904, ii, 360; from *Staz. sper. agar. ital.*, 37, 137—170).—Sea-salt is, on the whole, not injurious to the vegetation of salines. Old plants resist the action of sodium chloride better than young plants. Disease, when it occurs, is attributed to deficiency of humus or to the physical properties of the soil rather than to the amount of salt present. N. H. J. M.

Can Lithium and Cæsium exert any Stimulant Action on Phanerogams? M. NAKAMURA (*Bul. Coll. Agr. Tōkyō*, 1904, 6, 153—157).—Lithium carbonate had a slightly stimulating action on barley and peas, and cæsium chloride (0·1 gram per kilo. of soil) slightly increased the yield of rice. N. H. J. M.

Behaviour of Guanidine to Plants. I. KAWAKITA (*Bul. Coll. Agr. Tōkyō*, 1904, 6, 181—183).—Guanidine (0·1 per thousand) is injurious to chlorophyllous plants; biuret is somewhat less poisionous.

Fungi utilises guanidine as a source of nitrogen, but not as a source of carbon. N. H. J. M.

Action of Sodium Nitroprusside on Plants. RANA BAHADUR (*Bul. Coll. Agr. Tōkyō*, 1904, 6, 177—179).—Sodium nitroprusside has comparatively little poisonous action on lower animals and green plants, and has no action at all on fungi in absence of light.

In the case of higher animals, it is probable that the salt is decomposed into nitrous and hydrocyanic acids. N. H. J. M.

Peptone in Plant Seeds. W. R. MACK (*Zeit. physiol. Chem.*, 1904, 42, 259—273).—A peptone was isolated from resting lupin seeds in very small quantities. On decomposition with hydrochloric acid, it yields lysine, arginine, and glutamic acid. W. D. H.

Milk of Castilloa Elastica. ANNE W. K. DE JONG and WILLEM R. TROMP DE HAAS (*Ber.*, 1904, 37, 3298—3301. Compare Weber, Abstr., 1903, i, 845).—The milk has an acid reaction, is coagulated by methyl or ethyl alcohol, acetone, or acetic acid, but not by ammonia, potassium hydroxide, hydrochloric acid, tannic acid or formaldehyde, whether present in small quantities or in excess. The caoutchouc obtained by coagulation is free from nitrogen.

It turns brown on exposure to the air, gives a greyish-green coloration with ferric chloride. An oxydase is not present.

The globules in the milk are not surrounded by albumin, and the coagulation is not to be attributed to the coagulation of albumin (compare Weber, *loc. cit.*). Caoutchouc appears to be soluble in ether when left in contact with the solvent for some time. A viscid solution is obtained which cannot be filtered except after dilution. Tannin is present in the milk. J. J. S.

Cause of the Coagulation of the Milk of Castilloa Elastica. Anne W. K. de Jong and Willem R. Tromp de Haas (*Ber.*, 1904, 37, 3301—3305).—When the crude milk is used and alcohol or acetone is employed as the coagulating agent, it is found that the quantity of coagulated caoutchouc is proportional to the amount of agent employed up to a certain maximum and then gradually decreases. With acetic acid, on the other hand, no decrease occurs after the maximum has been obtained, and even a large excess of acid causes complete coagulation. When the milk has been purified by treatment with water, it is found that alcohol and acetone behave in exactly the same manner as acetic acid.

The milk which has been purified by the aid of water is readily coagulated on boiling, whereas the crude milk is not.

The coagulation brought about by the aid of acetone, alcohol, and acetic acid is accompanied by solution of resin. The greater part of this resin is on the surface of the drops, but a small portion is also present in the interior. J. J. S.

Examination of Gymnema Leaves. Frederick B. Power and Frank Tutin (*Pharm. J.*, 1904, [iv], 19, 234—239).—The leaves of *Gymnema sylvestre*, unlike those of *G. latifolium* (Greshoff, Abstr., 1891, 338), contain no cyanogenetic glucoside. On igniting the air-dried leaves, 8·6 per cent. of ash was obtained, which yielded the following results on analysis: CaO, 19·3 per cent.; Fe_2O_3 and Al_2O_3, 17·9 per cent.; MgO, 2·7 per cent.; the remainder consisted chiefly of alkali carbonates with traces of manganese and silica.

On adding water to an alcoholic extract of the leaves, a soft, dark green, resinous mass was obtained which contained formic and butyric acids and hentriacontane, melting at 68° and present in the leaves to the extent of about 0·05 per cent. When sulphuric acid was added to the filtrate from this precipitate, a dark-coloured resinous product was obtained. This substance, which was termed by Hooper (Abstr., 1889, 723) "gymnemic acid," is a complex mixture from which ethyl acetate extracts a portion possessing the property of temporarily destroying the sense of taste for sweet substances; this latter product, for which it is proposed to reserve the name "gymnemic acid" although there is no evidence that it is a homogeneous substance, amounts to about 6 per cent. of the air-dried leaves. It has weak acidic properties and, when fused with potassium hydroxide, yields acetic acid and a molecular *compound* of protocatechuic and *p*-hydroxybenzoic acids which melts at 192°; on oxidation with potassium permanganate, formic acid is produced. The resinous substance associated with the gymnemic acid in the precipitate obtained with sulphuric acid is also of an acidic nature, and yields the same products on fusion with potassium hydroxide. The liquid from which the above substances had been separated was found to contain *l*-quercitol (Trans., 1904, **85**, 624) together with *i*-dextrose. The fruits of *Gymnema sylvestre* contain the same substances as the leaves with the exception of *l*-quercitol.

Gymnemic acid and the resinous substance insoluble in ethyl acetate are devoid of toxic properties. E. G.

Medicinal and Useful Plants of Brazil. THEODOR PECKOLT (*Chem. Centr.*, 1904, ii, 460; from *Ber. Deutsch. Pharm. Ges.*, **14**, 308—334. Compare this vol., 142).—The abstract contains a detailed description of the quantitative composition of various parts of the following plants: *Momordica Charantia*, *Cayaponia cabocla*, *Trianosperma Martiana*, *Trianosperma diversifolia*, *Perianthopodus Espelina*, *Sicyos Martii*, *Sicyos quinquelobatus*, *Sicydium monospermum*, *Feuillea trilobata*, and *Anisosperma passiflora*. E. W. W.

Poisonous Action of Chromium Compounds on Lower Fungi, especially Saccharomycetæ. M. EMMANUEL POZZI-ESCOT (*Chem. Centr.*, 1904, ii, 350; from *Bull. Assoc. Chim. Sucre et Dist.*, **21**, 1141—1142).—The poisonous effect of chromium compounds varies. In the case of the compounds tried (potassium dichromate and chromate, chromic acid, and chrome alum), chromic acid is the most and chromic salts the least poisonous. N. H. J. M.

Fungicide Actions of Cultivations of Fungi. Y. KOSAI and OSCAR LOEW (*Bul. Coll. Agr. Tōkyō*, 1904, **6**, 77—79).—Vegetable cheese, known as "miso" (prepared from soy beans by means of *Aspergillus oryzæ*), when kept in an open beaker at a temperature which was allowed to rise to 33—35°, showed successively developments of yeast, *Sarcina*, and *Bacillus prodigiosus*. No traces of *Aspergillus* or *Penicillium* appeared. The substance finally became alkaline.

Further experiments showed that *Aspergillus oryzæ* (grown in solutions containing peptone, sugar, potassium dihydrogen phosphate, and magnesium sulphate) produces a fungicide substance which, however, is not equally injurious to all fungi.

Penicillium spores sown in slightly alkaline cultures of *Bacillus pyocyaneus* failed to develop. N. H. J. M.

Treatment of Crops by Stimulating Compounds. OSCAR LOEW (*Bul. Coll. Agr. Tōkyō*, 1904, **6**, 161—175).—A summary of the results obtained during the last three years. Manganese salts are probably beneficial in promoting the action of oxidising enzymes in changing noxious by-products of metabolism by partial oxidation.

Of the various stimulants tried, only manganese, fluorine, and iodine compounds promise to be of agricultural importance. Ferrous compounds also deserve attention, and Molisch has shown that iron is not only concerned in producing chlorophyll.

Having regard to the injurious action on crops of any excess of iodides and fluorides, it is recommended to restrict the employment of stimulants to manganous salts, which should be applied only in top-dressing (about 25 kilos. per hectare), in high dilution and in conjunction with ferrous sulphate (about 20 kilos. per hectare).

N. H. J. M.

Development of Rye and Wheat. BERNHARD SCHULZE (*Chem. Centr.*, 1904, ii, 790—791; from *Landw. Jahrb.*, 33, 405—441).—Rye acquired nearly half the total nitrogen by the end of winter. In the case of wheat, the nitrogen-assimilation took place chiefly from the end of April to the commencement of grain-formation. A good deal of potassium is taken up in the winter, especially in the case of rye, but most of it is assimilated at the time when carbohydrates are produced in greatest quantity. Calcium and magnesium are required only in small amounts by the young plants, and their utility, like that of silica, may presumably be connected with the strengthening of the tissues. Phosphoric acid is taken up during the period of growth in the spring and later. N. H. J. M.

Influence of Different Ratios of Lime to Magnesia on the Growth of Rice. KEIJIRŌ ASŌ (*Bul. Coll. Agric. Tōkyō*, 1904, 6, 97—102).—The lime factor for rice is about 1, being similar to that of other gramineous crops, which is between 1 and 2, but the yield of rice is less diminished by an excess of magnesium than by a similar excess of calcium. N. H. J. M.

Action of Different Forms of Nitrogen, especially Ammonia and Sodium Nitrate, on Potatoes and Oats. WILHELM SCHNEIDEWIND and DIEDRICH MEYER (*Chem. Centr.*, 1904, ii, 787—788; from *Landw. Jahrb.*, 33, 335—342).—Ammonium salts gave better results with potatoes than does sodium nitrate. With oats, the dry matter produced was somewhat less with ammonium salts than with sodium nitrate. Ammoniacal nitrogen is utilised more economically. The less intensively nitrogen acts, the greater the amount of organic matter produced by an equal amount of nitrogen assimilated, and *vice versâ*. N. H. J. M.

Different Behaviour of Potatoes and Mangolds towards Crude and Pure Potassium Salts. WILHELM SCHNEIDEWIND and DIEDRICH MEYER (*Chem. Centr.*, 1904, ii, 788—789; from *Landw. Jahrb.*, 33, 347—353).—Sodium chloride, the chief impurity of Stassfurt potassium salts, slightly increased the yield of potatoes when employed in conjunction with a small amount of potassium, but in presence of an abundance of potassium considerably diminished the yield. In similar experiments with mangolds, the yield was increased in both cases, especially the latter. Kainite is less suitable for potatoes and better for mangolds than the pure salts.

Potassium silicate and carbonate gave the worst results with potatoes, whilst for mangolds they are not inferior to the pure sulphate and chloride. N. H. J. M.

Can Salts of Zinc, Cobalt, and Nickel in High Dilution exert a Stimulant Action on Agricultural Plants? M. Nakamura (*Bul. Coll. Agr. Tōkyō*, 1904, 6, 147—152).—In experiments with *Allium* manured with zinc sulphate, nickel sulphate, and cobalt nitrate respectively (0·01 gram in 2 to 2·3 kilos. of soil), a slightly stimulating effect was observed in each case. With *Brassica chinensis*, nickel and cobalt slightly increased the leaf production, but not the roots. *Hordeum*, which was grown after *Brassica* without further application, was slightly stimulated by cobalt, whilst nickel and zinc proved to be injurious, although present in very small quantities. In experiments with peas, zinc was without effect, whilst cobalt and nickel had no very appreciable action. N. H. J. M.

Influence of Manganese on Trees. Oscar Loew and Seiroku Honda (*Bul. Coll. Agr. Tōkyō,* 1904, 6, 126—130).—Manganese sulphate applied to *Cryptomeria japonica* more than doubled the weight of the trees in 18 months. Ferrous sulphate and sodium nitrate had some effect in promoting the growth of twigs, whilst sodium chloride much reduced the growth. N. H. J. M.

Influence of Manganese Salts on Flax. Y. Fukutome (*Bul. Coll. Agr. Tōkyō*, 1904, 6, 136—137).—The joint application of iron and manganese had a distinct effect in increasing the yield of flax, whilst separately they had less effect. Cobalt nitrate (0·02 gram in 8 kilos. of soil) had also a stimulating effect. N. H. J. M.

Chemistry of Fruits. Karl Windisch and Karl Boehm (*Zeit. Nahr. Genussm.*, 1904, 8, 347—352).—The total nitrogen, nitrogen as proteids, amides, and ammonia, pectin substances, tartaric acid, and sugar, were determined in a number of fruits.

In red currants, gooseberries, bilberries, cranberries, quinces, wild pears, and medlars, the whole of the sugar was found to be invert sugar, and this was also the predominating sugar in black currants, mulberries, morella cherries, pears, apples, and sloes. Peaches contained 3·17 per cent. of sucrose and 1·02 per cent. of invert sugar. The greatest amount of total sugar was found in sloes (13·48 per cent.), and the least in peaches (4·19 per cent.). N. H. J. M.

Analyses of Fresh Chestnuts. Their Food Value and Manurial Requirements. Bertani Tomei (*Chem. Centr.*, 1904, ii, 346; from *Staz. sper. agrar. ital.*, 37, 185—199).—Two samples of fresh, peeled chestnuts (*a* and *b*) contained water, (*a*) 53·75 and (*b*) 11·80; dextrose, (*a*) 0·505 and (*b*) 1·204; sucrose, (*b*) 4·756; tannin, (*a*) 0·9; crude proteid, sol. in water, (*b*) 1·131; pure proteid, sol. in water, (*b*)

0·103; starch, (*a*) 8·010 and (*b*) 8·739; fat, (*a*) 1·83 and (*b*) 1·984; insoluble crude proteid, (*a*) 3·348 and (*b*) 5·231; insoluble pure proteid, (*a*) 2·428 and (*b*) 3·881; digestible proteid (insoluble), (*b*) 1·669. The ash constituents in (*b*) were as follows:

Pure ash.	CO_2.	K_2O.	Na_2O.	P_2O_5.	SO_3.	SiO_2.
1·200	0·406	0·274	0·399	0·219	0·100	0·014

The nutritive value is small. N. H. J. M.

Distilled Grape Residues. CARLO MENSIO and U. SOMMA (*Chem. Centr.*, 1904, ii, 610; from *Staz. sper. agrar. ital.*, 37, 392—397).—Two samples of the distilled residues from pressed grapes, the one (*a*) with stones and the other (*b*) without stones, were found to contain respectively 56·98 and 59·10 per cent. of water, 4·74 and 4·08 of crude proteid, 0·76 and 0·653 of nitrogen, 3·62 and 2·53 of fat, 19·88 and 19·60 of cellulose, 2·21 and 1·83 of pentosans, 10·50 and 9·16 of extractives free from nitrogen, 2·07 and 3·70 of mineral matter, 0·206 and 0·175 P_2O_5, and 0·328 and 0·478 K_2O. Both these materials might be used as fodder or as manure, the residues containing the stones being the more valuable. E. W. W.

Culture Experiments on the Action of Calcium Fluoride on Vesuvian Soil. GASPARE AMPOLA (*Gazzetta*, 1904, 34, ii, 156—165).—The soil employed in these experiments, as is very commonly the case in Italy, was very poor in potassium, the total potassium oxide being 42·13, that soluble in water 1·04, and that soluble in 5 per cent. acetic acid 2·83 parts per thousand of the soil. The land was manured with superphosphate and sodium nitrate, and varying amounts of calcium fluoride were applied. It was found that the crops were greatly increased by the use of calcium fluoride, and so also was the amount of potassium assimilated by the crops. The action of this salt is explained by the author as follows: the calcium fluoride is decomposed by very feeble organic acids, for example, carbonic acid, with liberation of hydrofluoric acid, which then acts on the complex silicates and renders the potash assimilable.
T. H. P.

Can Plant Analyses disclose the Amount of Assimilable Nutritive Substances in the Soil? M. STAHL-SCHRÖDER (*J. Landw.*, 1904, 52, 193—268).—In seasons with low rainfall, the nitrogen, and in a less degree the phosphoric acid, of oat grain increases. The numbers showing the relations between nitrogen and phosphoric acid proposed by Atteberg as indications of deficiency of nitrogen and phosphoric acid in the soil are not directly available for countries other than Sweden. In Courland the relation $N : P_2O_5$ is 100:30—40 in oat grain. Grain from the south-east of Russia contains more nitrogen and more phosphoric acid, the increase in the nitrogen being the greater.

The bases in oat grain give very little information as to the condition of the soil.

As regards oat-straw, increasing one manure constituent did not, as a rule, cause a diminution in the amounts of other constituents in the straw. A high percentage of potassium in straw indicates an abundance in the soil, but a low percentage does not necessarily indicate a deficiency in the soil. If, however, the low percentage of potassium in straw is coincident with high percentages of sodium, calcium, and magnesium, the conclusion to be drawn is that the soil is poor in assimilable potassium.

In the concluding portion of the paper, the methods of Joulie, Helmkampf, Ville, and Wilfurth are discussed. N. H. J. M.

Determination of the Available Amounts of Lime and Magnesia in the Soil. T. KATAYAMA (*Bul. Coll. Agr. Tōkyō,* 1904, **6**, 103—124).—The results of sand-culture experiments and experiments with two widely differing soils showed that, with onions, the best results are obtained when the relation $CaO : MgO = 2 : 1$.

The method employed for determining the available lime and magnesia is as follows: the particles of soils smaller than 0·25 mm. are separated and extracted for 50 minutes with 10 per cent. hydrochloric acid—50 c.c. acid to 25 grams of soil. Water (200 c.c.) is then added, and the diluted liquid boiled for 10 minutes longer and filtered after 15 hours. N. H. J. M.

Action of Calcium Cyanamide on Peat Soils BRUNO TACKE (*Bied. Centr.*, 1904, **33**, 583—584; from *Mitt. Ver. Förd. Moorkultur*, 1903, No. 23, 347).—Crude calcium cyanamide contains 14—23 per cent. of nitrogen, and was shown by Gerlach and Wagner's pot and field experiments to have a manurial value almost equal to that of sodium nitrate.

The results of pot experiments in which mustard was grown in peaty soil showed that less dry produce was obtained after application of calcium cyanamide than when no nitrogen was applied. A poisonous action was observed when the manure was added just before sowing the seed, but not when there was an interval of two-and-a-half months. N. H. J. M.

What Forms of Phosphoric Acid are Suitable for Manurial Purposes? PAUL WAGNER (*Bied. Centr.*, 1904, **33**, 513—515; from *Saaten-Dünger u. Futtermarkt.*, 1904, No. 5, 50).—The citrate-soluble phosphoric acid of bone-precipitate was found to be equal to that of basic slag, and both of these nearly equalled water-soluble phosphate.

Experiments with the precipitated phosphoric acid of double superphosphate, extending over nine years, showed that the citrate-soluble phosphoric acid was less active than water-soluble phosphoric acid, and that it was not assimilated by the plants (summer rye) with sufficient rapidity. In the second and subsequent years, however, its activity approached very nearly to that of water-soluble phosphoric acid. N. H. J. M.

Manurial Value of Dried Superphosphate. ACH. GRÉGOIRE and J. HENDRICK (*Chem. Centr.*, 1904, ii, 555; from *Bull. Stat. agric. Gembloux*, 74, 33—49).—Results of experiments with barley showed that the physical changes in superphosphate dried at 165° are without effect on the manurial value and that the action of the phosphoric acid is distinctly increased. Monocalcium phosphate, deprived of 2 mols. H_2O by heating at 165°, gave better results than the crystallised salt dried at 70°. The metaphosphate and the pyrophosphate prepared by completely driving off the water from the mono- and di-phosphates respectively have no manurial value. N. H. J. M.

Phosphatic Slags. ACH. GRÉGOIRE and J. HENDRICK (*Chem. Centr.*, 1904, ii, 555; from *Bull. Stat. agric. Gembloux*, 74, 50—57).—The action of 100 c.c. of a solution containing 21 per cent. citric acid, 4·3 per cent. of nitrogen as ammonia, 3 per cent. of ammonium fluoride and 2 per cent. of calcium nitrate on 1 gram of basic slag varied considerably, the results being but little influenced by heating at 70° instead of at 100° or by heating for 2 hours instead of 1 hour. The solution had hardly any effect on Martin slag and mineral phosphate. Pot experiments with barley showed that the phosphoric acid insoluble in the solution containing fluoride was not less active than the unchanged slags, whilst the phosphoric acid undissolved by 2 per cent. citric acid is distinctly less assimilable. N. H. J. M.

Action of the Phosphoric Acid of Fæces. Comparison of Wolter Phosphate with Superphosphate and Basic Slag. WILHELM SCHNEIDEWIND and DIEDRICH MEYER (*Chem. Centr.*, 1904, ii, 788; from *Landw. Jahrb.*, 33, 342—347).—Horse dung and cow dung gave very good results with mustard, corresponding with the solubility of the phosphoric acid soluble in citric acid. In pot experiments with oats, cow dung was even better than superphosphate, probably owing to other constituents of the dung.

Wolter phosphate gave, in pot experiments with mustard and oats, about the same results as superphosphate, and its after effect was somewhat greater than that of superphosphate. Less phosphoric acid was taken up from Wolter phosphate than from superphosphate, but more than from basic slag. N. H. J. M.

Action of Crude and Pure Potassium Salts with Different Forms of Calcium. WILHELM SCHNEIDEWIND and O. RINGLEBEN (*Chem. Centr.*, 1904, ii, 789; from *Landw. Jahrb.*, 33, 353—371).—When soil is deficient in calcium carbonate, potassium chloride and sulphate act better than kainite; otherwise kainite gave the best results. Gypsum was injurious to a mixture of clover and grasses, especially when kainite was applied. Oats were less affected, whilst potatoes were benefited by gypsum.

The action of sodium cannot be attributed only to its taking the place of potassium, inasmuch as it increases the yield in presence of a large excess of potassium. This may be due to the production of sodium nitrate and phosphate, and to the greater diffusibility of those salts as compared with the salts of other bases.

The chlorine of manures is deposited chiefly in the straw of cereals and in the leaves of root-crops. N. H. J. M.

Composition of the Incrustations in Roberts-Concentrators. Giuseppe Ongaro (*Chem. Centr.*, 1904, ii, 361—362; from *Staz. sper. agrar. ital.*, 37, 231—233).—The incrustation, obtained from a tobacco factory in Venice, was a yellowish-red powder containing water, 8·466; organic matter, 37·822; and ash, 53·712 per cent. The substance contains a good deal of readily assimilable phosphoric acid and nitrogen, and is suitable for manuring. N. H. J. M.

Analytical Chemistry.

Continuous-Observation Polarimeter Tube. John Simpson Ford (*Analyst*, 1904, 29, 281—282).—The 200 mm. tube described is made entirely of metal with glass end-plates secured by screw-caps as usual. At one end of the tube is fixed a conical funnel of about 65 c.c. capacity, and at the other a discharge pipe. The solution to be observed is poured into the funnel to fill the tube. After taking the reading, a second solution may be poured into the funnel and so on. Each successive solution quickly washes the previous one out of the tube, even when they are of different specific gravities.

W. P. S.

The Material and Shape of the Rotating Cathode. Herbert E. Medway (*Amer. J. Sci.*, 1904, [iv], 18, 180—182. Compare Abstr., 1903, ii, 613).—A silver crucible may be employed as a rotating cathode for the deposition of metals, the results obtained being as accurate as when platinum is employed. Deposited copper is removed by rubbing and finally by treatment with boiling hydrochloric acid. A nickel cathode is attacked, both during the process and in the subsequent removal of the deposit, causing inaccurate results. No coherent deposit can be obtained on aluminium.

The disc form of cathode is inferior to the crucible form in retaining the deposit. C. H. D.

Bunsen Burners and Combustion Apparatus without Gas. Harry Drake Gibbs (*J. Amer. Chem. Soc.*, 1904, 26, 760—764).—An arrangement for burning the vapour of alcohol (or other liquid combustibles) in Bunsen burners. For details, the original paper and drawings should be consulted. L. de K.

Mixed Indicators. Max Scholtz (*Zeit. Elektrochem.*, 1904, 10, 549—553).—If a solution of *p*-nitrophenol and phenolphthalein in hydrochloric acid is neutralised by potassium hydroxide solution, the yellow colour of the nitrophenol ion first appears and then the pink colour of the phenolphthalein. The nitrophenol is therefore a stronger acid than the phenolphthalein. In a similar way, all the indicators may be compared. The following is the order found by the author, beginning with the strongest acid: (1) alizarinsulphonic acid, iodoeosin; (2) *p*-nitrophenol; (3) luteol; (4) hæmatoxylin, rosolic acid; (5) litmus; (6) turmeric; (7) phenolphthalein. Some other indicators which give less sharp colour changes are the following.

Alizarin lies between *p*-nitrophenol and litmus, fluorescein lies between iodoeosin and litmus, and tropæolin 000 between luteol and litmus.

Cochineal and phenacetolin are stronger than litmus, gallein is stronger than *p*-nitrophenol, lacmoid is stronger than turmeric, and brazilin and α-naphtholbenzein are weaker than luteol and litmus respectively. Among the basic indicators, cyanine is a stronger base than methyl-orange or the tropæolins. T. E.

Application of Potassium Tetraoxalate in Titration. Georg Lunge (*Chem. Zeit.*, 1904, 28, 701—702).—A reply to Kübling's criticisms (*ibid.*, 596, 612) of a previous paper (this vol., ii, 289). The author has never been able to prepare a potassium tetraoxalate in which the water of crystallisation corresponds accurately with the formula $C_2O_4HK,C_2O_4H_2,2H_2O$; on the other hand, sodium carbonate and sodium tetraoxalate giving an analytical error of less than 0·1 per cent. can readily be obtained. W. A. D.

Use of Potassium Iodate for the Detection and Estimation of Iodides, Bromides, and Chlorides. Stanley Benedict and J. F. Snell (*Chem. Zeit.*, 1904, 28, 729).—In reply to criticisms, the authors state that they were unaware of the process of Ditz and Margosches (this vol., ii, 145) published previously, and also that their method differs in several particulars from that of Bugarszky, as the use of potassium iodate permits of the estimation of chlorides, bromides, and iodides in the presence of each other. W. P. S.

Estimation of Iodine in the presence of Bromine and Chlorine. E. Thilo (*Chem. Zeit.*, 1904, 28, 866).—The process is based on the fact that when silver nitrate is gradually added to a solution containing iodides, bromides, and chlorides, the iodine is precipitated first, followed by the bromine and then by the chlorine.

The solution is therefore titrated with $N/10$ silver nitrate until a drop of the liquid no longer gives a dark spot on paper impregnated with a weak solution of palladium chloride. The filtrate may be titrated for total bromine and chlorine as usual, using potassium chromate as indicator. If bromine only is to be estimated, it is sufficient to add enough $N/10$ silver nitrate to convert all the bromine with a portion of the chloride into the silver salts, which are then weighed in the usual manner. As the amount of metallic silver contained therein is of course known from the number of c.c. of silver solution added, the amount of silver bromide may be calculated easily.

Commercial iodine and cuprous iodide may be converted into soluble zinc iodide by trituration with zinc dust and water. If the silver iodide does not separate readily, a little salt may be added.

L. DE K.

Estimation of Fluorine in Martin Slag. L. FRICKE (*Chem. Centr.*, 1904, ii, 728—729; from *Stahl u. Eisen*, **24**, 889—890).—In order to determine the quantity of fluorine in Martin slag, 5 grams of the powdered slag mixed with 5—6 times the quantity of potassium carbonate are kept molten in a platinum crucible at a good heat for ½—1 hour. After extracting the cold mass with hot water and filtering, the silica and alumina are precipitated by prolonged boiling with ammonium carbonate. The filtrate is heated with a solution of zinc oxide in ammonia, evaporated to dryness, and heated to 120°. The residue is taken up with cold water and the zinc phosphate, carbonate, and silicate filtered off and washed with a 2 per cent. solution of potassium carbonate. To the filtrate, 1—1·5 grams of calcium chloride are added, it is then acidified with acetic acid, and the carbon dioxide removed by warming the solution. The solution is made alkaline with potassium hydroxide solution, and again faintly acid with acetic acid. The precipitate, which consists of calcium fluoride together with some calcium phosphate, is collected, washed with cold water until no more calcium can be detected in the washings, and finally ignited and weighed. It is then warmed with concentrated sulphuric acid in the platinum crucible, diluted, ammonia added until only faintly acid, and the phosphoric acid precipitated by molybdic acid. If only a small quantity of precipitate is formed, the phosphoric acid is estimated by titrating with lead acetate, but if the precipitate is larger it is dissolved and precipitated with magnesia mixture. The percentage of fluorine x may be calculated from the formula $x = 48{\cdot}72/s.(a - 1{\cdot}392d)$, in which a = weight of calcium fluoride and phosphate, d = weight of magnesium pyrophosphate, and s = weight of substance taken. The result may be checked by making the filtrate from the phosphomolybdic acid precipitate up to 250 or 500 c.c. and determining the quantity of calcium in 100 or 200 c.c. respectively. If c = weight of CaO, then $x = 67{\cdot}857/s.(c - 0{\cdot}7543d)$.

E. W. W.

Estimation of Water in Substances which afterwards are to be extracted with Volatile Solvents. ROBERT M. BIRD (*J. Amer. Chem. Soc.*, 1904, **26**, 818—826).—An arrangement chiefly devised for the estimation of water and fat in butter. The sample is introduced into a weighed Gooch crucible and dried in a current of hot air for 20—30 minutes; the loss in weight represents the water. The fat is then removed by extracting with ether for about half an hour, and the crucible is reweighed; the loss represents the fat. For full particulars of the apparatus, which admits of five estimations being conducted simultaneously, the original paper and drawings should be consulted.

L. DE K.

Application of Hydrazine Sulphate in the Determination of Oxidising Substances. U. Roberto and F. Roncali (*Chem. Centr.*, 1904, ii, 616; from *L'Ind. Chim.*, 6, 178—179).—Hydrazine sulphate acts with substances which liberate oxygen in precisely the same way as it does with chlorine (compare *ibid.*, 93), being decomposed by the oxygen and yielding sulphuric acid, water, and nitrogen. When potassium permanganate is gently heated with hydrazine sulphate, the solution is decolorised and nitrogen is evolved, 5 mols. of nitrogen being liberated by 4 of permanganate. In a similar way, 2 mols. of potassium dichromate yield 3 mols. of nitrogen. By measuring the volume of nitrogen liberated, the quantity of oxidising substance may be estimated. This method is also applicable to peroxides, chlorates, &c. E. W. W.

Forms in which Sulphur exists in Coal; their Effects on the Heating Power. E. E. Somermeier (*J. Amer. Chem. Soc.*, 1904, 26, 764—780).—The author has studied the influence of the sulphur in coals on their heating powers as calculated by Dulong's formula, and arrived at the following conclusions.

For sulphur present as ferrous sulphate, there is a loss of 10 cal. for each per cent. of sulphur. When the sulphur is present as iron pyrites, the result is too high by about 9·6 cal. for each per cent. on uncorrected ultimate analyses. On corrected analyses (where a correction has been made for oxygen in the ash), the results are too low by 6·6 cal. When the sulphur exists in an organic combination, there is a loss of about 4·5 cal. for each per cent. so present. L. de K.

Photometric Estimation of Sulphur in Coal. Samuel W. Parr and C. H. McClure (*J. Amer. Chem. Soc.*, 1904, 26, 1139—1143).—A description of an improved photometer used for the determination of small quantities of sulphates by means of barium chloride (compare Jackson, Abstr., 1902, ii, 172). For particulars, the illustration and table of the original paper should be consulted. L. de K.

Estimation of Sulphur in Iron. Allen P. Ford and Ogden G. Willey (*J. Amer. Chem. Soc.*, 1904, 26, 801—808).—The following process, originally proposed by Bamber, is recommended as being particularly suitable for analysts who have but limited experience in sulphur estimations. Two grams of the drillings are dissolved in nitric acid contained in a platinum dish covered with a watch-glass. When solution is complete, 1 gram of nitre is added, the liquid is evaporated to dryness, and the residue heated to redness for 3 or 4 minutes. The mass is now boiled with 50 c.c. of a 1 per cent. solution of sodium carbonate and the residue washed with the same hot liquid. The filtrate is freed from nitric acid by evaporating with hydrochloric acid, and the dry residue dissolved in 50 c.c. of water and 2 c.c. of hydrochloric acid. The sulphuric acid is then estimated as usual with barium chloride. L. de K.

Estimation of Sulphur in Pig-iron and Steel by Titration with Iodine and Thiosulphate Solution. L. FRICKE (*Chem. Centr.*, 1904, ii, 727—728; from *Stahl u. Eisen.*, 24, 890—891).—In order to estimate the quantity of sulphur in pig-iron or steel, 100 c.c. of water and 75 of concentrated hydrochloric acid are added, by means of a separating funnel, to 10 grams of steel or 5 of iron contained in a $\frac{1}{2}$—1 litre flask which is fitted with a condenser and receiver. The mixture is heated moderately. The water and hydrochloric acid vapours are mostly condensed, whilst the hydrogen sulphide passes through a dry vessel and then successively into three vessels of which the last two contain a solution of 25 grams of cadmium acetate in 200 c.c. of glacial acetic acid. The gas is finally expelled from the apparatus by carbon dioxide and the contents of the receiver are diluted to about 150 c.c. with the cadmium solution and titrated. For this purpose, iodine and sodium thiosulphate solutions are used, of which 1 c.c. corresponds with 1 mg. of sulphur (these solutions contain respectively 7·928 grams of iodine and 25 of potassium iodide, and 15·526 of thiosulphate and 2 of ammonium carbonate per litre). Excess of iodine solution is added to the cadmium sulphide together with 75 c.c. of a solution of 300 c.c. of concentrated hydrochloric acid in 850 c.c. of water (sp. gr. 1·124), and the excess of iodine titrated with sodium thiosulphate after adding 2 c.c. of an iodine-zinc-starch solution. The difference between the amounts of iodine and thiosulphate solution used gives the percentage of sulphur. E. W. W.

Estimation of Sulphur and Phosphoric Acid in Foods, Fæces, and Urine. J. A. LE CLERC and WILBUR L. DUBOIS (*J. Amer. Chem. Soc.*, 1904, 26, 1108—1113).—The authors have used the calorimetric processes of Berthelot and Parr, and also the sodium peroxide process recommended by Osborne (Abstr., 1902, ii, 223), and are in favour of the latter method.

Tables are given showing the amount of sulphur in various foods and dried fæces. In the case of urine, the direct titration of the phosphoric acid in the diluted sample with uranium acetate is preferred to the combustion processes. L. DE K.

Estimation of Sulphuric Acid in Urine by Alcoholic Strontium Chloride. ROLAND VON LENGYEL (*Pflüger's Archiv*, 1904, 104, 514—518).—The estimation of sulphuric acid in the urine by an alcoholic solution of strontium chloride instead of barium salts is recommended. The new method is correct and rapidly carried out.
W. D. H.

Estimation of Sulphuric Acid in presence of Iron. FRIEDRICH W. KÜSTER (*Zeit. angew. Chem.*, 1904, 17, 1180).—Silberberger concludes that sulphuric acid cannot be estimated in presence of iron by Lunge's method, and, in support of his contention, quotes Küster and Thiel (Abstr., 1899, ii, 247); Küster on the contrary holds that Lunge's method gives accurate results. A. McK.

Estimation of the Active Oxygen in Organic Persulphates. A. WOLFF and RICHARD WOLFFENSTEIN (*Ber.*, 1904, **37**, 3213—3214). —The method consists in adding sulphurous acid to the solution of the organic persulphate, whereby the sulphurous acid is oxidised to sulphuric acid, which is then estimated as barium sulphate.

E. F. A.

Comparison of the Gravimetric Methods for Estimating Selenium. ALEXANDER GUTBIER, G. METZNER, and JUL. LOHMANN (*Zeit. anorg. Chem.*, 1904, **41**, 291—304).—The majority of the gravimetric methods for estimating selenium are based on the use of reducing agents. The methods described were conducted with selenium dioxide, which was specially purified. Details are given of the reduction of selenium dioxide by hydrazine hydrate, hydrazine hydrochloride, hydrazine sulphate, sulphurous acid, sodium sulphite, ammonium sulphite, hydroxylamine hydrochloride, hydriodic acid, and hypophosphorous acid respectively. These various methods all yield good results. The methods recommended are those with hydrazine hydrate, hydrazine sulphate, hydrazine hydrochloride, and sulphurous acid.

A. McK.

Estimation of Tellurium by Electrolysis. GIOVANNI PELLINI (*Atti R. Accad. Lincei*, 1904, [v], **13**, ii, 275—277).—The author has further tested the method devised by him for the estimation of tellurium (this vol., ii, 147), by dissolving a known weight of pure redistilled tellurium in nitric acid, evaporating the nitric acid, adding concentrated sulphuric acid and ammonium hydrogen tartrate, and electrolysing as previously described. The results obtained have errors varying from about 0·08 to 0·16 per cent. It is found that quantities of tellurium much greater than 1 gram can be deposited, so that the method may be used for the purification of this element. T. H. P.

Estimation of Organic Nitrogen by Sodium Peroxide. FRITZ VON KONEK and ARTHUR ZÖHLS (*Zeit. angew. Chem.*, 1904, **17**, 1093—1095).—Organic substances are not, as a rule, quantitatively converted into nitric acid by sodium peroxide. The method gives good results, however, when applied to the estimation of nitrogen in flour.

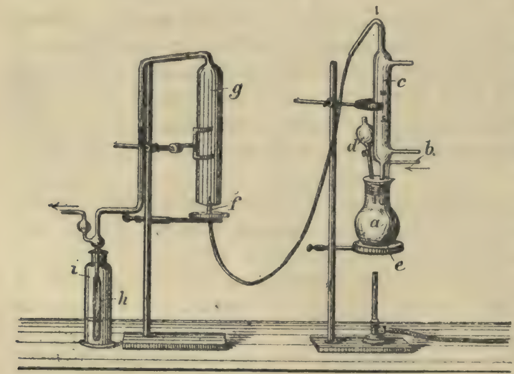
The flour, dried at 100—102°, is mixed in a steel cylinder with an excess of dry sodium peroxide, to which a mixture of potassium persulphate and tartaric acid had been added. The cylinder is kept cool in water, and when the vigorous oxidation, which is started by means of a red-hot iron wire, is complete the whole is dissolved in water. The nitrate is then reduced to ammonia by the addition of pumice, alcohol, and Devarda's alloy of aluminium and copper, and the ammonia estimated as in the Kjeldahl process. Results obtained from various specimens of flour by this method and by Kjeldahl's are in close agreement. A. McK.

Use of Sodium Peroxide in Analysis. HANS H. PRINGSHEIM (*Zeit. angew. Chem.*, 1904, **17**, 1454—1455).—A reply to von Konek (preceding abstract). As regards the nitrogen, up to 90 per cent. may be liberated as such during the combustion. L. DE K.

Estimation of Phosphorus in Solutions. ANASTASIOS C. CHRISTOMANOS (*Zeit. anorg. Chem.*, 1904, 41, 305—314. Compare this vol., ii, 614).—When a solution of yellow phosphorus in ether or in benzene is agitated with copper nitrate solution for a few seconds, a black precipitate is formed, which consists, not of the compound Cu_3P_2, but of mixtures of Cu_3P_2 and Cu_6P_2, approximating to the composition Cu_5P_2. The composition is, however, very variable and the precipitate is often highly oxidised.

In the method of estimation described, an ethereal solution of phosphorus is heated for several minutes with a 10 per cent. solution of copper nitrate, of which so much is taken that the solution remains blue after the black precipitate has subsided. The ether is then expelled and the product oxidised by bromine, when the actions represented by the equations: $Cu_6P_2 + Br_{12} = 3Cu_2Br_2 + 2PBr_3$ and $Cu_6P_2 + Br_{10} = Cu_2 + 2Cu_2Br_2 + 2PBr_3$, take place. After removal of the excess of bromine, the copper is separated as sulphide and the phosphorus determined by the addition of magnesia mixture in the usual manner. A. McK.

Estimation of Phosphorus in Calcium Carbide. HJ. LIDHOLM (*Zeit. angew. Chem.*, 1904, 17, 1452).—Ten grams of the powdered sample are put into a crucible, which is then placed into the 500 c.c. flask, *a*. A current of hydrogen is passed through the tube *b*, and when the air has been expelled the burner, *f*, is lit and the pump, attached to the exit tube of the wash-bottle *h*, put into action. After fitting on the condenser, 30 c.c. of absolute alcohol are introduced drop by drop through the funnel, *d*, and the same volume of water is then cautiously added. Any hydrogen phosphide formed will burn together with the hydrogen, and acetylene and the phosphoric acid will deposit partly on the sides of the cylinder, *g*, and partly find its way into the wash-bottle, *h i*. When evolution of acetylene has ceased, hydrochloric acid is added to dissolve the calcium hydroxide, and the liquid is heated to boiling so as to expel the last traces of phosphorus compounds.



The cylinder, wash-bottle, &c., are then rinsed with dilute ammonia and the phosphoric acid is precipitated as usual with magnesia-mixture. L. DE K.

Estimation of Phosphoric Acid in Aqueous Extracts of Soils and Plants. OSWALD SCHREINER (*J. Amer. Chem. Soc.*, 1904, **26**, 808—813).—The colorimetric process for the estimation of phosphoric acid in the presence of silica (this vol., ii, 85) has been found useful for the estimation of small quantities of phosphoric acid in aqueous solutions of soils and plants. If the solutions are not quite colourless, the colour should be removed by treatment with carbon black.

L. DE K.

Official Tests for Arsenic. WYNDHAM R. DUNSTAN and HENRY H. ROBINSON (*Pharm. J.*, 1904, [iv], **19**, 381—382, 405—407, 426—427, 448—450).—Instructions are given for applying Mayençon and Bergeret's test (Abstr., 1874, 1008), which depends on the yellow stain produced by arsenic hydride on mercuric chloride paper, to the drugs of the B. P. The stain given by 0·012 mg. of arsenic is used as a standard for comparison. When 4 grams of the drug are employed in the test, this stain represents 3 parts of arsenic per million. It is considered that for most drugs which are administered in small doses, the amount of arsenic present should be less than 3 parts per million, whilst in the case of tartaric and citric acids the quantity present should be less than 1 part per million, for the principal mineral acids, 3/10 part per million, and for solution of ammonia, 1/10 part per million. Special directions are given for the application of the test to a number of drugs which offer particular difficulties.

E. G.

Electrolytic Methods for the Detection and Approximate Estimation of Minute Quantities of Arsenic in Beer, Malt, and Food-stuffs, &c. WILLIAM THOMSON (*Mem. Proc. Manchr. Lit. Phil. Soc.*, 1904, **48**, xvii, 1—14).—The author has experimented on the use of various cathodes in the electrolytic estimation of arsenic. With lead, smaller quantities of arsenic could be detected than with platinum, but the results were irregular; with aluminium and plumbago, 50 c.c. of a solution containing 1/500 grain per gallon gave no mirror, whilst tin was not procured sufficiently free from arsenic.

A form of apparatus in which pure zinc serves as a cathode is recommended and described in the paper. A comparison between it and the apparatus recommended by the Royal Commission is given, in respect to the influence of amyl alcohol and invert sugar on the production of the mirror. The preliminary reduction of arsenic to arsenious compounds is not necessary.

G. D. L.

Estimation of Boric Acid in Cider, Fruits, &c. ALFRED H. ALLEN and ARNOLD R. TANKARD (*Pharm. J.*, 1904, [iv], **19**, 242—244).—The presence of boric acid in cider and fruits can be detected by the following method. The ash obtained by evaporating 20 c.c. of cider or apple juice to dryness and igniting the residue, or by directly igniting 25 grams of the fruit, is acidified with dilute hydrochloric acid; a piece of turmeric paper is immersed in the liquid and the mixture is evaporated to dryness. If boric acid is present, the turmeric paper assumes a brownish-red colour, which is changed to a variety of colours, chiefly green and purple, when moistened with solution of sodium hydroxide.

The following method is recommended for estimating the boric acid. About 100 c.c. of cider or fruit juice are treated with a few c.c. of 10 per cent. calcium chloride solution and evaporated to dryness, or a quantity of the fruit (about 50 grams) is cut into small pieces and a solution of calcium chloride poured over the mass, which is afterwards dried. The dry residue is well charred and then boiled with 150 c.c. of water and the liquid filtered. The carbonaceous residue is incinerated at a moderate temperature and afterwards boiled with 150 c.c. of water and left for a few hours. The liquid is then filtered and the filtrate added to the first extract. The mixed filtrates are evaporated to 25—30 c.c. and, when cold, are neutralised with $N/10$ acid, methyl-orange being used as indicator. An equal volume of glycerol is now added and the liquid is titrated with $N/20$ sodium hydroxide in presence of phenolphthalein. A further quantity of glycerol (about 10 c.c.) is added, and the titration continued until a permanent red coloration is produced. Each c.c. of $N/20$ sodium hydroxide required represents 0·0031 gram of boric acid.

An alternative method for the estimation of boric acid is given. The substance is treated with calcium chloride in the manner already described, and is afterwards charred and extracted with about 50 c.c. of water. The aqueous extract is transferred to a 100 c.c. flask and evaporated nearly to dryness. The charred residue is ignited, the ash is moistened with 2 c.c. of strong sulphuric acid, and the mixture warmed; when the greater part of the hydrogen chloride has been expelled, the residue is added to the concentrated liquid in the distilling flask. The last portions are washed into the flask with 10 c.c. of methyl alcohol and the liquid is distilled nearly to dryness. Successive quantities of 10 c.c. of methyl alcohol are added to the cold residue, the distillation being repeated after each addition; six such treatments are usually sufficient to ensure the volatilisation of the whole of the boric acid. The alcoholic distillate is passed into 25 c.c. of water in a flask. When the distillation is finished, the liquid is evaporated until free from alcohol; the methyl borate is hydrolysed by this treatment and a solution of boric acid remains. This solution is diluted with a little water and rendered neutral to methyl-orange. An equal volume of glycerol is added, and the liquid is titrated with sodium hydroxide in presence of phenolphthalein just as in the preceding method.

The results of the estimation of boric acid in various samples of apples, pears, quinces, pomegranates, grapes, cider, and apple juice are appended.

E. G.

Analysis of Coal. HENRI PELLET (*Chem. Centr.*, 1904, ii, 791—792; from *Bull. Assoc. Chim. Sucr. Dist.*, 21, 1203—1223).—Most of the ordinary methods of analysis of fuels are described and compared in the original paper, with special reference to the sugar industry. The samples of coal should pass through an 80 or 100 sieve. The moisture is determined by heating 1—2 grams at 100—105° and weighing for the first time in 10—15 minutes;

weights varying by 2 mg. or less are considered constant. The ash is estimated by gradually heating 0·5—1 gram in a flat platinum dish to a red heat in a muffle; under favourable conditions, the weight is constant in 15—30 minutes. The volatile matter is determined by heating 1—2 grams in a covered platinum crucible at a red heat; the crucible is heated for 3 minutes after gas has ceased to burn at the lid. The sulphur is estimated from the sulphuric acid formed in combustion in a calorimetric bomb, or by heating 1 gram of powdered coal with a mixture of 20 grams of sodium carbonate and 10 of potassium nitrate, and precipitating as barium sulphate. If iron sulphide is present in coal, it is converted on burning into ferric oxide and sulphuric acid, and the quantity of sulphate in the coal is not increased. Calcium carbonate is decomposed at a dark red heat in presence of silica.

Heraeus' electric furnace is recommended for the determination of the ash and volatile matters at 1000°, and for other operations which require a constant temperature. E. W. W.

Estimation of Carbon and Sulphur in Iron and Steel. A. Müller (*Chem. Zeit.*, 1904, 8, 795—796; *Zeit. angew. Chem.*, 1904, **17**, 1453—1454).—A compact form of apparatus is described for the combustion of the evolved gases. The whole is mounted on one stand and consists of a capillary platinum U-tube for the actual combustion, a drying tube, and a soda-lime absorption tube. The drying tube is a combination of a spiral and a U-tube. The spiral contains a mixture of phosphoric and sulphuric acids, whilst the limb of the U-tube next the combustion tube is filled with phosphoric oxide held in position by wads of glass-wool. The evolution flask is provided with a condenser reaching down the inside of its neck, the outlet for the gases being at the upper part of the neck (Corleis' pattern). In the estimation of sulphur, the platinum combustion tube is replaced by a quartz-glass tube and the hydrogen sulphide is absorbed by means of cadmium acetate. W. P. S.

An Improved Geissler Apparatus for the Estimation of Carbon Dioxide. Engelbert Kettler (*Zeit. angew. Chem.*, 1904, **17**, 1097—1098).—The apparatus described is a modified form of Schrötter's for the estimation of carbon dioxide in carbonates. It is provided with four openings; the first, for the tube containing the dilute acid; the second, for the introduction of the carbonate; the third is kept stoppered until the carbon dioxide evolved is practically all expelled from the apparatus, when a calcium chloride tube is attached to this opening and the removal of carbon dioxide then completed; the fourth contains the sulphuric acid for drying. The apparatus yields good results. A. McK.

Analysis of Soluble Glass (Sodium Silicate). Paul Heermann (*Chem. Zeit.*, 1904, **28**, 879—880, 883—884).—A paper dealing principally with the estimation of free alkali in commercial sodium silicate solution.

Ten grams of the sample are diluted with 100 c.c of water and mixed with 100 c.c. *N*-barium chloride. The mixture is diluted to 250 c.c.

and at once passed through a dry filter; the first 20—30 c.c. are rejected. One hundred c.c. of the filtrate are now titrated with *N*/10 hydrochloric acid, using phenolphthalein as indicator. L. DE K.

Gravimetric Estimation of Calcium. ENGELBERT KETTLER (*Zeit. angew. Chem.*, 1904, **17**, 1488—1489. Compare this vol., ii, 517).—A reply to Brück (this vol., ii, 681). The author still thinks that weighing the calcium as sulphate is more convenient than its conversion into carbonate. L. DE K.

Results obtained in Electrochemical Analysis by the use of a Mercury Cathode. RALPH E. MYERS (*J. Amer. Chem. Soc.*, 1904, **26**, 1124—1135).—A lengthy paper unsuitable for adequate abstraction, setting forth the advantages of the use of a mercury cathode in the electrolytic separation of a number of metals. By its means even chromium may be quantitatively separated from aluminium.

L. DE K.

Volumetric Estimation of Lead. ERIC JOHN ERICSON (*J. Amer. Chem. Soc.*, 1904, **26**, 1135—1139).—A modification of Walters and Affelder's method (Abstr., 1903, ii, 614) applied to brasses and bronzes. The alloy is dissolved in nitric acid, and to the filtrate is added excess of ammonia and then some ammonium persulphate. On boiling, the lead is precipitated as dioxide and washed first with dilute ammonia and then with hot water. The precipitate is treated with nitric acid and a known volume of hydrogen peroxide, the excess of which is then estimated with standard permanganate solution. From the result, the amount of lead is readily calculated. The permanganate should preferably be checked against lead nitrate.

L. DE K.

New Method for the Volumetric Estimation of Copper, and its Application to the Testing of Copper Sulphate and Commercial Copper Sulphide. GIOACHINO GRIGGI (*Chem. Centr.*, 1904, ii, 367; from *Boll. Chim. Farm.*, **43**, 392—394).—The reaction on which the method is based is the reduction of copper sulphate by hydroxylamine, according to the equation: $(NH_2{\cdot}OH)_2,2HCl + 4CuSO_4 + 10KOH = 2Cu_2O + N_2O + 2KCl + 4K_2SO_4 + 9H_2O$. To a solution of 1·39 grams of hydroxylamine hydrochloride in water, 5·6 grams of potassium hydroxide are added, and the solution is made up to 1 litre. This hydroxylamine solution is then added gradually to the copper salt solution until reduction is complete; heat may be required. The sulphates of iron, zinc, sodium, magnesium, and other metals interfere with the straightforward course of the reaction. J. C. P.

Electrolytic Assay of Copper containing Arsenic, Antimony, Selenium, and Tellurium. GEORGE L. HEATH (*J. Amer. Chem. Soc.*, 1904, **26**, 1120—1124).—If the metal contains arsenic and antimony, but less than 0·01 per cent. of joint nickel, cobalt, and zinc, it is dissolved in nitric acid, evaporated with sulphuric acid, and finally deposited electrolytically from an ammoniacal solution. For details of the electrolysis, the original paper should be consulted. If only traces of antimony, and less than 0·02 per cent. of arsenic, but large amounts of tellurium or selenium are present, the latter are removed by treating the boiling solution of the sulphate with a current of sulphur dioxide; the filtrate is then electrolysed. If the sample contains more than 0·01 per cent. of antimony and other elements, these may be removed by precipitation with ammonia in the presence of ferric nitrate.

The author has also introduced another process which is based on the fact that under certain conditions the electrolytic co-precipitation of any arsenic present is prevented by addition of solid ammonium nitrate. L. DE K.

Analysis of Bauxite. TAUREL (*Ann. Chim. anal.*, 1904, 9, 323—327).—An aliquot part of the solution, free from silica, obtained by the usual process, is precipitated with ammonia, and, after purifying the washed precipitate, by redissolving in hydrochloric acid and reprecipitating with ammonia; it is finally ignited and weighed. It represents aluminium and ferric oxides, and possibly also titanic acid. Another portion is then neutralised with ammonia, any precipitate is redissolved in formic acid, and some 5 c.c. of this is added in excess. After reducing the iron by means of a current of sulphur dioxide, the whole is boiled for an hour, and an excess of solution of ammonium citrate is added, followed by ammonia and ammonium sulphide. The precipitate so obtained, after washing and ignition, represents iron oxide and titanic acid.

If it is desired to weigh the titanic acid separately, an aliquot part of the solution is precipitated with ammonia, some 10 c.c. in excess of formic acid are added, the iron oxide is reduced completely with sulphurous acid, and the whole is very gently boiled for an hour. The precipitate is allowed to settle for a few hours, and the supernatant liquid is, so far as possible, siphoned off. The precipitate is then collected on a filter and washed with boiling water (it generally runs through the filter at first). It is finally ignited and weighed.

The filtrate may, of course, be used for a repeated iron determination. L. DE K.

Electrolytic Estimation of Manganese. J. KÖSTER (*Zeit. Elektrochem.*, 1904, 10, 553—554).—A platinum-iridium basin and a platinum anode making 600—700 revolutions per minute are used. The solution contains 5 to 10 grams of ammonium acetate, 3 grams of chrome alum, and a few c.c. of alcohol in addition to the manganese salt, which must not be the chloride. A current of 0·04 to 0·045 ampere per sq. cm. may be used, which requires about 7 volts. The liquid is heated to 75° before beginning the electrolysis; the temperature should not be allowed to rise above 85°. Alcohol (about 10 c.c.) may be used instead of the chrome alum with almost equally good results. The quantity of manganese present should not exceed 0·3 gram, otherwise the precipitate is apt to peel off. The precipitation is complete in 20 to 25 minutes. T. E.

Quantitative Precipitations and Separations by means of Ozone. Paul Jannasch and Willy Gottschalk (*Ber.*, 1904, **37**, 3111).—On passing ozonised oxygen through a solution of manganese ammonium sulphate acidified with acetic acid, the manganese is quantitatively precipitated as manganese tetroxide. W. A. D.

Estimation of Manganese in Drinking Water. Georg Baumert and Paul Holdefleiss (*Zeit. Nahr. Genussm.*, 1904, **8**, 177—181).—From 250 to 1000 c.c. of the water, according to the amount of manganese present, are acidified with 1 c.c. of hydrochloric acid and evaporated to a volume of less than 100 c.c. Towards the end of the evaporation, a little zinc oxide or barium carbonate is added to precipitate any iron present. The whole is then filtered and the precipitate washed until the filtrate amounts to 100 c.c. Five c.c. of a 10 per cent. solution of sodium hydroxide are added to the latter, which should be contained in a stoppered flask, and the mixture shaken for 5 minutes, the stopper being frequently lifted to admit air. Five c.c. of a 10 per cent. potassium iodide solution are now introduced, together with sufficient hydrochloric acid, drop by drop, to dissolve the brown precipitate. After the addition of starch solution, the liberated iodine is titrated with sodium thiosulphate solution (about 0·3 gram per litre) which has been standardised against a solution of pure manganous chloride.

To avoid the evaporation of a large volume of the water, the manganese may be separated by Knorre's method (Abstr., 1903, ii, 760) and then estimated by the above method. W. P. S.

Chemico-toxicological Detection of Potassium Permanganate. Dioscoride Vitali (*Chem. Centr.*, 1904, ii, 794—795; from *Boll. Chim. Farm.*, **43**, 493—504).—When potassium permanganate is taken into the organism, since no free acid is present except in the stomach, the hydroxide of manganese dioxide is formed. This change takes place so quickly that the administration of an antidote such as an acid solution of hydrogen peroxide is scarcely possible. When finely chopped meat is treated with the permanganate, the surface becomes brown; the presence of manganese can be detected in the ash by the violet coloration which is formed when it is treated with excess of concentrated sulphuric acid and potassium bromate added. The meat also gives the following reactions. By the action of concentrated hydrochloric acid, an intensely brown coloration is formed which becomes blue on the addition of water and potassium iodide. A similar coloration is also obtained by adding water and a few drops of guaiacum tincture. When the meat is treated with 10—20 times its quantity of concentrated hydrochloric acid and aloin then added, a red coloration is formed. A violet colour is obtained by adding water, an ethereal solution of phthalin, hydrochloric acid, and finally potassium hydroxide until alkaline, and shaking. By agitating the meat with dilute hydrochloric acid and some drops of a solution of aniline sulphate, a blue or bluish-green coloration is formed.

The hydroxide of manganese dioxide acts on the albumin, forming an albuminate. Since the permanganate only attacks the external portions of the tissue, putrefaction of the internal portion is not prevented, and the ammonium sulphide which is formed reduces the manganese dioxide to oxide, and finally converts it into sulphide, the brown colour being of course destroyed; in such cases, a test for manganese can only be applied. Pugliese has found that in the case of guinea-pigs a dose of about 0·2 gram, and for men about 10 grams, of permanganate per kilogram is fatal. A tissue which has been treated with potassium permanganate decomposes hydrogen peroxide with great rapidity, liberating oxygen; the fibrin of blood has also this property, but to a much less degree. E. W. W.

New Reaction for Iron in Copper. ED. CROUZEL (*J. Pharm. Chim.*, 1904, [vi], 20, 203—205).—Equal volumes of ten per cent. solutions of copper sulphate and sodium thiosulphate are mixed, when, after twenty-four hours, a greenish-yellow precipitate, passing into the yellow, crystalline double cuprous sodium thiosulphate, is formed, but if iron is present the colour is altered by the formation of an ochre-coloured basic ferric sulphite.

Should an excess of thiosulphate have been employed, the iron can be detected by means of potassium ferrocyanide. G. D. L.

Estimation of Tungsten. LOYS DESVERGNES (*Ann. Chim. anal.*, 1904, 9, 321—323).—A criticism of various methods already proposed, The following method is said to give fairly correct results. Twenty-five c.c. of the alkali tungstate, obtained in due course, are neutralised with dilute nitric acid, using litmus solution as indicator; while boiling, a solution of mercurous nitrate containing precipitated mercuric oxide in suspension is added, and the mercurous tungstate so obtained, after being washed on a filter with a weak solution of mercurous nitrate, is dried and ignited. The residue consists of tungstic acid, which is then weighed as such. It is as well to repeat the analysis once or twice. L. DE K.

Estimation of Uranium. F. GIOLITTI (*Gazzetta*, 1904, 34, ii, 166—170).—In a solution containing uranium in the form UX_4, the addition of a slight excess of hydrofluoric acid causes the formation of a heavy, pulverulent, green precipitate, which is possibly UF_4; this can be readily washed both by decantation and on the filter with water rendered faintly acid with hydrofluoric acid. If the uranium is present in the liquid as a uranyl salt of the type UX_6, it is necessary to reduce it to the form UX_4 before precipitating with hydrofluoric acid. On igniting the precipitate, together with the filter, at a bright red heat in an open crucible, it becomes completely converted into the oxide U_3O_8, which can be weighed. If this oxide is further ignited in a current of dry hydrogen until it becomes constant in weight, it is reduced to the dioxide UO_2, the weight of which acts as a check on that of the U_3O_8. This method is given by the author for the estimation of uranium, and is found to yield good results.

Another, and in some ways more convenient, method of procedure with uranyl salts is to place the solution, together with 4—5 c.c. of concentrated hydrofluoric acid, in a smooth Classen electrolytic capsule, the volume of liquid being then made up to 100—150 c.c. with water. Making the capsule the negative electrode and using a current density of about 0·8 ampere per sq. cm., the green, insoluble fluoride becomes loosely deposited on the capsule, from which it can be readily transferred to the filter. The ignition is then carried on as before. This method, in which the reduction is carried out without the introduction into the solution of foreign substances such as stannous chloride, also gives satisfactory results. T. H. P.

Estimation of Tin, Antimony, and [Arsenic] in Ores and Alloys. Henri Angenot (*Zeit. angew. Chem.*, 1904, **17**, 1274—1275).—The process is based on the use of sodium peroxide. On heating about half a gram of an ore or alloy containing tin, antimony, and perhaps arsenic and other metals, with 7 grams of sodium peroxide in an iron crucible, the three metals are rapidly oxidised and converted into sodium salts, which are then treated with water [or in the case of antimony with dilute alcohol (1 : 2)] and diluted to 250 c.c. The solution contains the tin and in some cases also arsenic or lead. On adding dilute sulphuric acid to 200 c.c. of the filtrate, the tin is precipitated as metastannic acid, and may be freed from any lead by heating with nitric acid; from arsenic, it may be freed by the ammonium chloride method (*Zeit. anal. Chem.*, 1895, **34**, 557).

The antimony which is left undissolved as sodium pyroantimoniate is separated from any other insoluble metallic oxides by digesting in hydrochloric and tartaric acids, then treating the solution with sodium hydroxide and sodium sulphide. After filtering off any undissolved sulphides, the antimony is recovered by precipitation with dilute sulphuric acid, or the solution is submitted to electrolysis and the antimony weighed as metal. L. de K.

Comparative Experiments on the Gravimetric Estimation of Antimony as Trisulphide and Tetroxide respectively. Alexander Gutbier and G. Brunner (*Zeit. angew. Chem.*, 1904, **17**, 1137—1143).—Quite as good results can be obtained when antimony is estimated as tetroxide as when it is estimated as trisulphide, if the manipulation in the former case is conducted according to Brunck's method (Abstr., 1895, ii, 372). A. McK.

Coloration of Borax Beads by Colloidal Dissolved Noble Metals. Julius Donau (*Monatsh.*, 1904, **25**, 913—918. Compare this vol., ii, 684).—If a borax bead is moistened with a solution of a gold salt and then fused, it becomes ruby-coloured, on long heating, blue and finally colourless unless much gold is present, when, after long heating, the bead is liver-coloured by reflected, blue by transmitted light. A solution containing 0·7 mg. of gold per 30 c.c. colours the bead red. The ruby colour is replaced by violet, and the reaction is less delicate if much sodium chloride is present. The reaction does not take place in presence of free sulphuric acid or halogens. The gold reaction is masked by the presence of more than 6 per cent. of platinum.

The borax bead is coloured yellow by silver. The reaction will detect 0·00018 mg. of silver. The influence of other substances is the same as in the case of gold.

Platinum colours the borax bead reddish-brown by transmitted light; the reaction detects 0·00005 mg. of platinum, Iridium and osmium give coloured borax beads similar to the platinum bead. Rhodium gives a brown, and palladium and ruthenium black beads. G. Y.

Action of Soap on Calcium and Magnesium Solutions. V. Hugo Gottschalk and H. A. Roesler (*J. Amer. Chem. Soc.*, 1904, 26, 851—856).—A paper illustrated by curves showing peculiarities in the titration of calcium and magnesium salts with soap solution.

L. de K.

New Method for destroying Organic Matter in Toxicological Analyses. Oreste Gasparini (*Atti R. Accad. Lincei*, 1904, [v], 13, ii, 94—100).—The author's method for destroying organic matter is as follows. The substance, after being freed as far as possible from alcohol, is covered with concentrated nitric acid in a beaker over which is placed a clock-glass provided with holes for admitting two glass tubes containing platinum wires connected with platinum electrodes. After the acid has been allowed to act for some time, a current of 4—6 amperes at a voltage of 8 is passed through the solution. The organic matter is destroyed either in a few hours or in a few days, according to the nature and quantity present and to the current intensity. In this way, the nitric acid is split up into ions, the hydrogen ion then acting on more nitric acid, forming water and nitrous acid, which latter then becomes resolved into water, nitric oxide, and nitrogen peroxide. The anion also probably reacts, thus: $2NO_3' + H_2O = HNO_3 + O$ and $NO_3' = NO_2 + O$. The nitrogen oxides and the nascent oxygen formed in this way readily oxidise the proteid substances. The solution is then filtered in the cold and the filtrate and wash-water evaporated as far as possible on the water-bath, the residue being then taken up in 35—50 c.c. of nitric acid and subjected once more to electrolysis for five or six hours. It is then evaporated to dryness, the residue dissolved in water, and analysed in the ordinary way. The insoluble portion, which may consist of fat, stannic oxide, antimonic oxide, silver chloride, and insoluble sulphates, is intimately mixed with a mixture of four parts of potassium nitrate with one of anhydrous sodium carbonate, and the whole gradually added to a porcelain crucible containing a little potassium nitrate. The mass is kept in a fused state for some time, then allowed to become nearly cold, and the crucible placed in a porcelain basin containing cold water. The remaining operations are conducted as usual.

With meat, eggs, &c., to which arsenic trioxide, mercuric chloride, silver, barium chloride, lead nitrate, zinc sulphate, or copper sulphate had been added, this method gave good results.

Sulphuric acid may be employed instead of nitric, but the oxidation is then slower and there is a tendency for the proteid substances to froth unpleasantly; further, some of the elements, arsenic for example, then give rise to volatile products. T. H. P.

Estimation of Benzene Vapour in Coal-gas. Otto Pfeiffer (*Chem. Zeit.*, 1904, **28**, 884—885).—A half-litre separating funnel is filled with the sample of gas, and when all the air has been displaced, 2 c.c. of Harbeck and Lunge's reagent (equal vols. of sulphuric and fuming nitric acid) are introduced through the stem and left in contact with the gas for half an hour, the acid being allowed to spread over the sides of the funnel. Solution of sodium hydroxide is now introduced until the colour changes to orange-red, and hydrochloric acid is then added until the liquid just turns a pale sherry colour. The liquid is then shaken twice in succession with 50 c.c. of ether for 5 minutes, and the ethereal solution placed in a flask over 1 gram of dry potassium carbonate and 0·5 gram of blood charcoal. After a few hours, the liquid is filtered and the charcoal well washed with ether. The filtrate is heated in a flask on a water-bath until the ether has evaporated, and the residual dinitrobenzene is then dissolved in alcohol and estimated, volumetrically by Limpricht's process (Abstr., 1878, 335), titrating with stannous chloride and iodine. L. de K.

Contribution to the Analysis of Rose Oils. Paul Jeancard and C. Satie (*Bull. Soc. chim.*, 1904, [iii], **31**, 934—937).—The authors consider that the percentages of stearopten and of citronellol in rose oil are the most important criteria of its quality. The former is determined by dissolving 10 grams of the oil in 50 c.c. of acetone, cooling this mixture to $-10°$, and filtering through a tared paper placed in a well-cooled funnel. The stearopten so separated is dried over sulphuric acid under reduced pressure. The filtrate, which should not yield a further deposit when again cooled to $-10°$, is used, after the removal of the acetone by distillation, for the determination of citronellol and "total alcohols." The acid and saponification numbers are determined on the original oil. The paper gives tables of the principal constants of (1) oils distilled from Provence roses under various conditions, and (2) of the range of variation shown recently by Bulgarian rose oil. The results obtained with Provence oil are analogous to those found by Schimmel and Co. for Saxony oil.

T. A. H.

Estimation of Methyl Alcohol in Formaldehyde. Heinrich Bamberger (*Zeit. angew. Chem.*, 1904, **17**, 1246—1247).—When the sulphanilic acid method for estimating methyl alcohol in presence of formaldehyde according to Gnehm and Kaufler (this vol., ii, 520) is employed, a slight decomposition of the condensation product during the distillation cannot be avoided, and the slight amount of aldehyde which passes into the distillate appreciably influences the result.

The author's method is conducted as follows. The formaldehyde solution is mixed with sodium hydrogen sulphite and the condensation to sodium hydroxymethylenesulphonate conducted at the ordinary temperature for several hours in a closed vessel. The product is then exactly neutralised by sodium hydroxide and distilled; the amount of alcohol in the distillate is estimated by density determinations. Sodium hydroxymethylenesulphonate remains practically undecomposed when heated in neutral solution. The results obtained by this method are higher than those obtained by Gnehm and Kaufler's method.

A. McK.

Two New Methods for the Estimation of Sugar. H. P. T. Oerum (*Zeit. anal. Chem.*, 1904, 43, 356—371).—(I) By the employment of Meissling's colorimeter (this vol., ii, 440) for the colorimetric estimation of the copper reduced by sugar from Fehling's solution, satisfactory results can be obtained. The cuprous oxide is collected on an asbestos filter (not on paper), and after washing is dissolved in 10 per cent. nitric acid and the colour compared with a standard solution of copper sulphate. As the amount of copper reduced is not strictly proportional to the sugar present, it is better to calculate the amount of the former from the colorimetric readings and to obtain the corresponding amount of sugar from a table such as Allihn's. The method has been found very serviceable for sugar estimations in urine.

(II) The mercury reduced by sugar from Sachsse's solution may be collected on a filter paper, washed first with warm 1 per cent. hydrochloric acid, and then thoroughly with water, dissolved in boiling nitric acid, and then titrated by $N/10$ ammonium thiocyanate with iron alum as indicator, exactly as in Volhard's method for silver estimation. It is well to standardise the solutions by a known amount of grape sugar. The rapidity and convenience of the method render it very suitable for clinical work.

M. J. S.

The Molisch-Udránszky α-Naphthol Sulphuric Acid Reaction. B. Reinbold (*Pfluger's Archiv*, 1904, 103, 581—617).—The best conditions under which this reaction can be obtained are described. By the gentle action of sulphuric acid on dextrose, no furfuraldehyde is formed, but another volatile compound, which gives a bluish-violet colour with α-naphthol and sulphuric acid; its spectrum shows an ill-defined band between λ594 and 582. Besides this there are two other volatile substances formed, one of which is acid and the other neutral; the last gives the magenta-sulphuric acid reaction, but neither reduces ammoniacal silver solutions.

W. D. H.

Detection of Abrastol in Wine. Emilio Gabutti (*Chem. Centr.*, 1904, ii, 370; from *Staz. sper. agrar. ital.*, 37, 234—236).—The wine (100 c.c.) is treated with a few drops of ammonium hydroxide, extracted with amyl alcohol (10—15 c.c.), filtered, and evaporated to dryness. The residue is heated with some strong phosphoric acid, again heated after addition of 1—2 drops of a concentrated formaldehyde solution, and filtered. The filtrate shows a green fluorescence in presence of abrastol.

N. H. J. M.

Estimation of Cellulose in Foods and in Fæces. Oscar Simon and Hans Lohrisch (*Zeit. physiol. Chem.*, 1904, 42, 55—58).—Ten grams of the substance (dried at 100°) are heated at 100° for 1 hour with 50 per cent. potassium hydroxide solution. When cold, 3—4 c.c. of hydrogen peroxide solution are added and, if necessary, the mixture is again heated until it is colourless or only pale yellow. It is allowed to cool and then mixed with half its volume of 96 per cent. alcohol; if the solutions will not mix, a little concentrated acetic acid is added. The precipitated cellulose is allowed to settle, removed to a hardened filter paper, washed thoroughly with water, dilute acetic acid, alcohol, and ether. The precipitate usually contains a small amount of nitrogen (under 1 per cent.), and when obtained from fæces is extremely rich in ash (20—40 per cent.). J. J. S.

Estimation of the Total Acidity in Proteid Substances. Siro Grimaldi (*Chem. Centr.*, 1904, ii, 854—855; from *Staz. sper. agrar. ital.*, 37, 463—475).—It has been shown (*ibid.*, 35, 706) that the proteids, especially those of milk, combine with mineral acids to form compounds which are neutral towards the ordinary indicators. In order to determine the total acidity, an excess of normal sodium hydroxide solution is added to the milk which has been previously treated with a known quantity of sulphuric acid. The excess of alkali is titrated; the difference corresponds with the amount of acid added to the milk, and the natural acidity of the milk. A second method consists in determining the quantity of sulphuric acid which is necessary to cause coagulation of the milk on warming, adding normal sodium hydroxide solution until the coagulum is dissolved, and titrating the excess of alkali with decinormal sulphuric acid. The coagulum formed by rennet differs from that obtained by means of sulphuric acid in its behaviour towards dyes such as aromatic sulphonic acids. The methods described above are not, however, affected by the presence of organic acids. The results obtained are generally about twice as great as those found by the usual methods. E. W. W.

Toxicological Detection of Hydrogen Cyanide. Domenico Ganassini (*Chem. Centr.*, 1904, ii, 718—791; from *Bull. soc. med.-chir. Pavia.* See this vol., ii, 758).

Estimation of Saturated Fatty Acids. Wilhelm Fahrion (*Zeit. angew. Chem.*, 1904, 17, 1482—1488).—An adverse criticism of the new process introduced by Partheil and Ferié (this vol., i, 5). L. de K.

The Lithium Method of Separating Saturated Fatty Acids. K. Farnsteiner (*Zeit. Nahr. Genussm.*, 1904, 8, 129—136).—Partheil and Ferié have described a method for the separation of the saturated fatty acids of various fats and oils (this vol., i, 5), according to which 1 gram of the fat is saponified and precipitated from an alcoholic solution with lithium acetate. The solution is warmed to dissolve the precipitate, and, on cooling, lithium stearate, palmitate, and myristate (partially) are said to crystallise out, whilst lithium laurate and the remainder of the myristate remain in solution. The laurate is converted into the lead salt and separated, and the insoluble lithium salts separated by fractional crystallisation. The author has investigated this method, and comes to the conclusion that it is quite untrustworthy, and that the percentages of palmitic, stearic, myristic, and lauric acids found by Partheil and Ferié in butter, margarine, and lard are incorrect. Apart from the experimental data given, it is also shown that the presence of lauric and myristic acids in lard would considerably influence the saponification value of the latter. The lard examined by Partheil and Ferié had a normal saponification value. W. P. S.

Rapid Analysis of Cream of Tartar and Tartaric Acid Baking Powders. R. O. Brooks (*J. Amer. Chem. Soc.*, 1904, 26, 813—818).—The total tartaric acid is estimated by Kenricks' polarimetric molybdate method (Abstr., 1903, ii, 112). The amount of combined tartaric acid (as potassium hydrogen tartrate) is found by deducting the amount of carbon dioxide in the original powder from the quantity corresponding with the alkalinity of the white ash, and calculating the difference to its equivalent amount of potassium hydrogen tartrate. The difference between the total and combined tartaric acid then gives the free acid present.

Starch is best estimated by treating the powder with cold 3 per cent. hydrochloric acid. The undissolved starch is collected in a Gooch crucible, washed first with cold water, then with alcohol, and finally with ether. After drying at 110° for two hours, it is weighed, then ignited, and reweighed, when the loss will represent the starch.

L. de K.

Rapid Method for Estimating Fat in Milk. J. van Haarst (*Zeit. angew. Chem.*, 1904, 17, 1212—1213).—Polemical. A reply to Siegfeld (Abstr., 1903, ii, 458. Compare van Haarst, Abstr., 1903, ii, 516). A. McK.

Indirect Estimation of Milk Fat by means of Fleischmann's Formula. Albert Steinmann (*Ann. Chim. anal.*, 1904, 9, 348—350).—A controversy with Pierre on the above subject.

L. de K.

Comparison of the Halogen Absorption of Oils by the Hübl, Wijs, Hanuš, and McIlhiney Methods. Lucius M. Tolman (*J. Amer. Chem. Soc.*, 1904, 26, 826—827. Compare Abstr., 1903, ii, 458).—The original Hübl process is unsatisfactory. The process given by Hanus (Abstr., 1902, ii, 112) gives very good results provided the reagent is added from 60—70 per cent. in excess. Wijs's process (Abstr., 1902, ii, 586) gives slightly higher results, but it is sufficient to add the reagent in excess to the extent of 35 per cent. In both these processes, 30 minutes' contact is sufficient to complete the reaction.

If it is desired to determine also the extent of the substitution, a solution of iodine chloride in carbon tetrachloride is recommended as being preferable to a solution of bromine in the same solvent (McIlhiney's reagent). L. de K.

Colour Reactions of Fatty Oils. Part III. Hans Kreis (*Chem. Zeit.*, 1904, 28, 956—957. Compare Abstr., 1903, ii, 114).—A *résumé* of the two earlier papers. Further particulars are given as to sesamol prepared by first agitating sesamé oil with hydrochloric acid and then so often with alcohol that the oil no longer gives the characteristic furfuraldehyde reaction. The alcoholic liquid is evaporated and the residue freed from fatty acids by treatment with dilute ammonia and calcium chloride. The filtrate then yields the sesamol to ether. It cannot be distilled without decomposition. In sulphuric acid, it dissolves with a green colour. Its ethereal solution, shaken with seed oils and nitric acid, gives a passing green coloration. The author thinks that sesamol is a phenol of high molecular weight with at least two hydroxyl groups in the meta-position and probably allied to naphtharesorcinol. If a piece of pine-wood is immersed in sesamol and then in hydrochloric acid of sp. gr. 1·19, it turns a dark green (a new lignin reaction). L. de K.

Betaine Periodide and the Estimation of Betaine by a Solution of Iodine in Potassium Iodide. Vl. Staněk (*Zeit. Zuckerind. Böhm.*, 1904, 28, 578—583).—The addition of a solution of iodine in potassium iodide solution to an aqueous solution of a betaine salt produces in the cold a brownish-red precipitate, rapidly changing into green crystals with metallic lustre, and in the hot to a green, metallic-looking oil which crystallises on cooling. The same precipitate is obtained by adding a solution of iodine in hydriodic acid to one of betaine or its hydrochloride. It is only slightly soluble in water, but on boiling with the latter, iodine is evolved and betaine hydriodide goes into solution; it is readily dissolved by alcohol, hydriodic acid, or aqueous potassium iodide. It melts at 58—61° with copious evolution of iodine vapours. Its composition varies with the conditions of formation and approximates to that of the hexa-iodide,

$$C_5H_{11}O_2N,HI,I_5.$$

From very concentrated solutions of betaine, a solution of iodine in hydriodic acid precipitates a substance which has nearly the composition of betaine tri-iodide and which becomes green and assumes a metallic lustre when treated with water.

The betaine in a 1—3 per cent. solution of its hydrochloride is almost quantitatively precipitated by potassium tri-iodide (100 grams of potassium iodide and 153 grams of cyanogen-free iodine dissolved in 200 c.c. of water), when the solution is saturated with sodium chloride and the precipitate washed with saturated sodium chloride solution; the betaine in the precipitate is estimated by determining the nitrogen by Kjeldahl's method. When the betaine solution is very dilute or the precipitant is used in large excess, the results obtained are low. The betaine may also be precipitated from solutions containing 44 per cent. of sulphuric acid in place of the sodium chloride.

In this way, betaine may be separated from glycine, asparagine, tyrosine, glutamic acid, and ammonium salts. The precipitation is not affected by acetic or lactic acid, or by the constituents of the ash of molasses. Carbamide is partially precipitated with the betaine and a marked precipitation occurs with the substances contained in Liebig's meat extract, probably peptones and purine bases.

In an acidified dilute solution of molasses, potassium tri-iodide produces a copious black, and to some extent crystalline, deposit containing 1·64 per cent. of nitrogen; 65 parts of this nitrogen consist of betaine-nitrogen. T. H. P.

Choline in Cerebrospinal Fluid. JULIUS DONATH (*Zeit. physiol. Chem.*, 1904, 42, 563—567).—Polemical against Mansfeld (this vol., ii, 623). The criticisms passed on the methods for detecting choline are shown to be fallacious. A combination of the author's method with that originally introduced by Halliburton and Mott excludes any possible confusion with inorganic chlorides, even although traces of the latter may be soluble in absolute alcohol. Various observers are quoted who have recently confirmed the value of the choline test. [No reference is, however, made to the results obtained by Allen (this vol., ii, 623) by the iodine test.] W. D. H.

Reactions for Brucine and Strychnine. I. Brucine. C. REICHARD (*Chem. Zeit.*, 1904, 28, 912—914).—If a solution of brucine or its sulphate is evaporated on the water-bath with addition of silver nitrate, the silver is partly reduced and a black powder remains covered with a varnish-like substance. If the latter is now moistened with a drop of solution of stannous chloride, a very characteristic deep red colour is obtained.

If a trace of brucine or its sulphate is triturated with a drop of a 10 per cent. formaldehyde and then evaporated to dryness, a residue is obtained which, on being moistened with a drop of stannous chloride, turns blue and changes to a yellowish-green on warming. L. DE K.

Estimation of Codeine in Opium. CHARLES E. CASPARI (*Pharm. Rev.*, 1904, 22, 348—352).—Fifty grams of opium are extracted with water and the aqueous extract evaporated on the water-bath to a volume of about 250 c.c. Five grams of barium acetate are added and the solution diluted to 700 c.c. The precipitate formed, consisting of the meconic acid and much of the resin, is collected on a filter and washed with cold water. The filtrate is again concentrated, treated with barium acetate, diluted, and filtered. These operations are repeated until the addition of barium acetate, followed by dilution, produces no further precipitate. The solution is then concentrated and a slight excess of 10 per cent. sodium hydroxide solution added. This precipitates the thebaine and narcotine, which are collected on a filter, the morphine, codeine, and narceine remaining in solution in the filtrate. The latter is acidified with dilute hydrochloric acid, concentrated, and an excess of 2 per cent. ammonia solution added. Most of the morphine is precipitated, and is collected on a filter and washed. The filtrate is again acidified, concentrated, treated with ammonia, and filtered if necessary. After acidifying and evaporating the filtrate to a volume of 75 c.c., it is rendered alkaline with ammonia and thoroughly extracted with benzene, which dissolves the codeine, but not the narceine. The residue obtained on distilling off the benzene is treated with an excess of *N*/10 sulphuric acid, and the excess titrated with *N*/10 sodium hydroxide. A sample of Smyrna opium yielded 1·12 and 1·33 per cent. of codeine as the results of two estimations.

The author considers that there are two serious objections to Van der Wielen's method (Abstr., 1903, ii, 519). In the first place, the quantity of opium taken for the estimation is too small; and secondly, the use of an aliquot part of the ethereal solution does not conduce to accuracy. W. P. S.

Estimation of Nicotine in presence of Pyridine. James A. Emery (*J. Amer. Chem. Soc.*, 1904, 26, 1113—1119).—The method is based on the fact that nicotine rotates the plane of polarisation, whilst pyridine does not. The liquid to be tested is compared polariscopically with a solution of pure nicotine of about 1 per cent. strength, which has been carefully checked against *N*/5 hydrochloric acid. The readings are expressed in degrees of the sugar scale. After deducting the alkalinity due to the nicotine from the total alkalinity, the amount of pyridine may be calculated with fair accuracy. In applying the process to the analysis of tobacco extracts, &c., the mixed bases are isolated by Kissling's process (extraction with ether in presence of sodium hydroxide, distillation of the ethereal residue, after adding some more alkali, in a current of steam, and titration with acid, using methyl-orange as indicator). If nicotine only is wanted, the tedious preliminary extraction with ether may be omitted. L. de K.

Alkaloid Reactions. C. Reichard (*Chem. Centr.*, 1904, ii, 369; from *Pharm. Zeit.*, 49, 523—524. Compare Abstr., 1903, ii, 458, and this vol., ii, 374).—A trace of morphine, when added to a mixture of formaldoxime and concentrated sulphuric acid and heated, produces an intense bluish-violet, opaque liquid. The colour remains when a small amount of water is added, but dilution with much water almost decolorises the solution. Sodium hydroxide at once destroys the colour, ammonia less quickly.

Atropine when similarly treated, yields a brownish-black coloration, which disappears when a few drops of water are added. No coloration is produced with cocaine, strychnine, or brucine. N. H. J. M.

Detection of Quinine by J. J. André's Reaction. P. Guigues (*J. Pharm. Chim.*, 1904, 20, [vi], 55—57).—The colour reaction of quinine with chlorine water and ammonia is prevented when tincture of orange is present. G. D. L.

Some Colour Reactions. J. B. Ballandier (*J. Pharm. Chim.*, 1904, [vi], 20, 151—152).—On allowing bromine vapour to be absorbed by feebly acid solutions of quinine and quinidine, a pale yellow colour is produced. One drop of copper sulphate solution, followed by the gradual addition of ammonia, then gives a pink colour, changing to violet and finally green. Mineral acids, with the green solution, give blue or violet according to the acid used (the green colour being restored by alkalis), the pink and violet solutions similarly yielding green colours with acids.

The green colour produced with quinine by bromine and ammonia is changed by copper sulphate to blue, which is unaltered by acids.

Chelidonine and narceine give the same green tint with sulphuric acid and the tannin of gall nuts, but chelidonine alone gives a pure carmine colour with sulphuric acid and guaiacol. G. D. L.

The Xanthine Bases in Meat, Yeast, and other Extracts. II. In Yeast Extracts. Karl Micko (*Zeit. Nahr. Genussm.*, 1904, 8, 225—237).—Methods are given for the further purification of the various fractions containing the xanthine bases of yeast extract (this vol., ii, 458), the processes being similar to those employed in the case of meat extract (Abstr., 1902, ii, 369).

With regard to the occurrence of carnine in meat extracts, the author in no instance detected the presence of this base, and considers that it is either only occasionally present or that it is of a transitory nature.

Hypoxanthine was found to crystallise in two modifications. One form consisted of needles containing water of crystallisation, which spontaneously and readily lost their water, yielding anhydrous octahedra. W. P. S.

Chemical and Physiological Assay of Digitalis Tinctures. George Barger and W. Vernon Shaw (*Pharm. J.*, 1904, [iv], 19, 249—254).—A comparative study of the chemical and physiological methods of estimating the digitoxin in tincture of digitalis has shown that only the latter method is trustworthy. The amount of digitoxin found by Keller's method (Abstr., 1898, ii, 267) is less than half the quantity actually present, and the digitoxin prepared in this way contains 33 per cent. of impurity. The results of the examination of several samples of digitalis tincture by both methods are tabulated. E. G.

Estimation of Tannin and Gallic Acid. W. Porter Dreaper (*Chem. News*, 1904, 90, 111, 112).—For the method proposed, the following solutions are required: (1) copper sulphate solution of such strength that each c.c. corresponds with 0·05 gram of cupric oxide; (2) 50 grams of ammonium carbonate and 50 grams of sodium sulphite in 1 litre; and (3) 20 grams of lead acetate and 60 c.c. of glacial acetic acid in 1 litre. Fifty c.c. of the tannin solution, containing from 10 to 15 grams of the tannin material per litre, are titrated with the copper solution, after heating with excess of calcium carbonate and cooling. Potassium ferrocyanide is used as indicator. The result represents the total tannin and gallic acid expressed as cupric oxide. A second quantity of 50 c.c. of the tannin solution is then treated with 25 c.c. of the sulphite solution (2) and titrated with the copper solution. In this titration, the indicator must contain an excess of acetic acid. The result represents the tannin alone. The relation of cupric oxide to tannin may be ascertained by collecting the precipitate on a filter, drying at 105°, and weighing. The amount of copper oxide present being known, the tannin may be calculated. Fifty c.c. of the tannin solution are again taken and treated with 10 c.c. of the lead acetate solution in the presence of barium sulphate. After shaking, the precipitate is collected on a dry filter and a small amount of anhydrous sodium sulphate added to the filtrate. The lead sulphate is filtered off and 40 c.c. of the filtrate heated with calcium carbonate and titrated with the copper solution. The result gives the gallic acid in the filtrate, and, by difference, the total tannin. The latter may or may not agree with the amount found in the second titration, any difference being due to the tannin (soluble or insoluble) in the ammoniacal solution. This classification of the tannins is a recognised one, and the method forms a means of quantitatively separating the two groups. W. P. S.

Volumetric Estimation of Methylene-blue. LOUIS PELET and V. GARUTI (*Bull. Soc. chim.*, 1904, [iii], 31, 1094—1097).—The authors, utilising the suggestion of Seyewetz (Abstr., 1900, i, 356, 522, 614, 645) that the formation of insoluble compounds between basic and acidic dyes might be applied to the estimation of these substances, have carried out some experiments on the estimation of methylene-blue by means of crystalline ponceau, "carmine," pyramine-orange, and cotton-brown. Of these, the first is considered to give the best results.

To a known volume of the methylene-blue solution (0·5 per cent. in water) is added, drop by drop, a similar solution of the acid dye until a drop of the liquid placed on filter paper shows the tint of the acid dye used as a precipitant. The precipitate formed when crystalline ponceau is added to methylene-blue consists of 2 mols. of the former to 1 mol. of the latter; with "carmine," the compound produced contains 1 mol. of each dye. The pyramine-orange and cotton-brown used were impure and the composition of the precipitates formed with these was not determined. T. A. H.

Rapid Method of Distinguishing between Rosaniline and Pararosaniline. RUDOLF LAMBRECHT and HUGO WEIL (*Ber.*, 1904, 37, 3031).—If 1 part of commercial rosaniline is dissolved by heating with 20 parts of 30 per cent. hydrochloric acid, no crystallisation takes place on cooling, or even after some days. If pararosaniline is treated in the same way, the sparingly soluble hydrochloride crystallises out immediately the solution is cooled. This difference can be used to detect the presence of 0·5 per cent. of pararosaniline in rosaniline, the rust-coloured pararosaniline hydrochloride crystallising out after 12 hours; the presence of larger proportions of pararosaniline (5—10 per cent.) is shown by immediate crystallisation on cooling.

If rosaniline is dissolved in too small a volume of hydrochloric acid, the polyhydrochloride slowly separates in crystals. G. Y.

Estimation of Lecithin in Plants. ERNST SCHULZE (*Chem. Zeit.*, 1904, 28, 751, 752).—In the estimation of lecithin in plants and seeds, the absolute alcohol used for the extraction does not dissolve out any phosphorus-containing compound other than lecithin. With regard to the decomposition of lecithin at temperatures exceeding 60°, the author considers that, for safety, this temperature should be adhered to. Whether the lecithin in combination with albumin is completely extracted at 60° still remains to be proved. The factor employed for calculating the phosphorus found into lecithin is only approximate, as lecithin has been obtained from rye and barley corns containing only 2·2 to 2·3 per cent. of phosphorus, whilst the usually occurring distearyl-lecithin contains 3·84 per cent. of phosphorus.

W. P. S.

The Ferricyanide Method of Estimating Oxygen in Blood. Franz Müller (*Pfluger's Archiv*, 1904, **103**, 541—580).—Some modifications of the Haldane-Barcroft apparatus are proposed, and the method is found to be highly satisfactory. Some investigations on the dissociation curve of dog's blood are described, and a number of researches on the question in health and disease are propounded for future work.

W. D. H.

Estimation of the Alkalinity of Blood. Sergei Salaskin and Z. Pupkin (*Zeit. physiol. Chem.*, 1904, **42**, 195—199).—Further experiments by the Salkowski-Salaskin method have been carried out. The process consists in heating the blood with ammonium sulphate under reduced pressure and in a Nencki-Zaleski apparatus, the temperature of the water-bath being kept at 40°. The operation lasts two hours. Good results can be obtained with 10 c.c. of blood. The values are quite different when water is added.

Under similar conditions, namely, reduced pressure at 40° and evaporation to dryness, sodium hydroxide, carbonate, and hydrogen carbonate evolve the equivalent amount of ammonia. In a 15 per cent. solution, disodium hydrogen phosphate drives out ammonia until it is half transformed into monosodium salt. The monosodium phosphate does not evolve ammonia. Similarly, proteids evolve practically no ammonia.

J. J. S.

Simple Clinical Method of Estimating the Different Proteids in Urine. Adolf Oswald (*Chem. Centr.*, 1904, ii, 858—859; from *Münch. med. Woch.*, **51**, 1514—1515).—The amount of the different proteids in urine may be estimated by means of Esbach albuminometers in the following way. In the first, the total quantity of albuminous substances is estimated by means of Esbach's reagent. Three more are filled with urine from a burette to the mark U. To the second is added a quantity of a saturated solution of ammonium sulphate, sufficient to give a ratio of salt to urine of 28 : 7·2; the concentration in the mixture corresponds with 28 per cent. saturation and is equal to the limit of precipitation of fibrinogen. The third is the euglobulin fraction and in this a ratio of 3·6 : 6·4 and a saturation of 36 per cent. are obtained, whilst in the fourth or ψ-globulin fraction the ratio is made 5 : 5 and the saturation 50 per cent. After shaking, the albuminometers are allowed to remain for several hours. The clear liquid is then removed by a siphon or by filtration, and the precipitate dissolved in water to which, preferably, a little sodium carbonate has been added. The albumin is then estimated in each case by means of Esbach's reagent in the usual way, a few drops of acetic acid being added if sodium carbonate has been previously used. Albuminometer 2 gives the quantity of fibrinogen or fibrinoglobulin. The quantity of albumin found in the precipitate from 3, less that obtained from the precipitate in 2, is equal to the quantity of euglobulin, and, similarly, 4—3 corresponds with the ψ-globulin and 1—4 the albumin.

The following results, expressed in percentages, have been obtained in cases of nephritis:

	Total albumin.	Fibrinogen.	Euglobulin.	ψ-Globulin.	Albumin.
Acute Scarlet Nephritis...	10	0	2·5	1·5	6
Acute Nephritis (advanced)	12	0	0	0·5	11·5
Acute Nephritis	5	0	0·25	1·25	3·5
Chronic Nephritis	4—8	0	trace	1—2	3—6

E. W. W.

Detection and Estimation of Albumin in Urines. H. Bellocq (*Ann. Chim. anal.*, 1904, 9, 384—385).—One hundred c.c. of the clear urine are mixed with one gram of calcium acetate, neutralised with ammonia, and thoroughly boiled with constant shaking until the froth rapidly disappears when the source of heat is removed. The precipitate is at once collected, and, without washing, introduced into a 40 c.c. tube, where it is treated with 3 c.c. of nitric acid. The phosphates and oxalates dissolve, and the urates are also gradually decomposed with effervescence, whilst the albumin is not dissolved. The tube is now filled with strong alcohol and shaken. Any turbidity or deposit shows the presence of albumin. If the amount is to be estimated, the precipitate is collected, washed with alcohol slightly acidified with nitric acid, and then dried at a very moderate heat.

L. de K.

Volumetric Estimation of Humus in Soil by means of Potassium Permanganate. W. Istscherekoff (*Chem. Centr.*, 1904, ii, 559; from *J. exper. Landw.*, 5, 55—66).—The ground soil is boiled for 40—50 minutes with titrated permanganate solution, sulphuric acid and water in a 250—300 c.c. flask, and titrated with oxalic acid. It is sometimes necessary to boil with an excess of oxalic acid, to dissolve the manganese peroxide, and to titrate back with permanganate. The results agree well with those obtained by Gustavson's method.

The humus may also be estimated by weighing the carbon dioxide produced. N. H. J. M.

General and Physical Chemistry.

Fluorescence. Friedrich Kehrmann (*Ber.*, 1904, 37, 3581—3583. Compare Kauffmann and Beisswenger, Abstr., 1903, i, 700; this vol., ii, 528).—The author draws attention to a former paper (Abstr., 1901, i, 52) in which he demonstrated a connection between the fluorescence of certain substances and the nature of the solvent, similar to that found by Kauffmann and Beisswenger. The change of fluorescence is probably due to a change in the position of the ortho-quinonoid linkings. C. H. D.

Comparison of the Ionisation produced in Gases by Penetrating Röntgen and Radium Rays. A. S. Eve (*Phil. Mag.*, 1904, [vi], 8, 610—618).—The chief objection to the view that the γ-rays and Röntgen rays are identical in their nature has consisted in the divergent effects produced by the respective rays when ionising various gases and vapours. All three types of radium rays produce ionisation currents proportional to the densities of the gases through which the rays pass, a law which has not been found to be valid in the case of the Röntgen rays. It is now shown, however, that when more penetrating rays from a hard bulb are employed, the law applies even in the latter case, except for methyl iodide; it was found to be valid for air, hydrogen sulphide, sulphur dioxide, chloroform, and carbon tetrachloride.

The author also criticises Paschen's conclusions (this vol., ii, 461) as to the nature of the γ-rays of radium. J. C. P.

Comparison of the Röntgen Rays with the Radiations emitted from Radiotellurium. E. Villari (*Rend. Accad. Sci. Fis. Mat. Napoli*, 1904, [iii], 10, 159—160).—The radiations from a copper rod covered with radiotellurium have a less penetrating power than X-rays. They are stopped by glass or aluminium, 1 mm. or less in thickness, and are incapable of passing through a sheet of ordinary paper. They penetrate slightly an ordinary linen handkerchief, and to a greater extent a very thin bladder or sheet of parchment. The air blown from a bellows over a glass tube rubbed on the radiotellurium rapidly acquires the power of discharging an electroscope and loses it slowly. When the rod itself is placed near the knob of the electroscope, the latter is rapidly discharged, but the discharge is retarded or accelerated by blowing the active air away from or towards the electroscope.

Air rendered active by X-rays loses its discharging power to only a small extent when passed through a slightly electrified tube, but if the electrification of the tube is strong, the air ionised by the X-rays has to be passed for about 2 hours in order to discharge the tube. On the other hand, air ionised by the radiotellurium reduces a strongly electrified glass tube to a non-electrified condition in a few minutes.

If the discharging capacity of carbon dioxide submitted to the action of the radiotellurium radiations is taken as 1, that for air is 3—5, that for illuminating gas 7—8, and that for hydrogen 20.

T. H. P.

Radioactivity. C. Bonacini (*Nuovo Cimento,* 1904, [v], 8, 125—130. Compare this vol., ii, 530).—The author has made attempts to compare the gradation of a photographic plate acted on by light with that of a plate subjected to the radiations of radioactive material. The latter itself cannot be employed as the source of light, since the light it emits is not homogeneous over its whole surface, thus differing from the radioactive emanations. The ordinary scale employed in sensitometry with reference to light is inapplicable to the emissions from radioactive matter, owing firstly to the great penetrating power of the radiations and also to the diffusion which they undergo when they come into contact with other substances. Preliminary experiments show that the gradations in the cases of light and radioactive emanations exhibit marked differences.

Experiments have also been made on the transformations undergone by active radiations on meeting solid substances, the results already obtained by Madame Curie, by Becquerel, and by Villard being in disagreement. The substance the diffusion of which was to be studied was placed behind and in direct contact with a sensitive plate, which was then exposed to active radiations. After development of the plate, the diffused rays manifest themselves as a reinforcement of the general opacity in the region of contact.

All the substances experimented with by the author become active towards a photographic plate when struck by active radiations. The greatest effects are exhibited by lead, platinum, and substances which fluoresce under the action of these radiations, for example, barium platinocyanide and uranyl ammonium fluoride. Other conditions being the same, the actions are here greater than with the X-rays. The action is to be attributed mainly to the deviable constituent (β-rays) of the emanations. The diffused portion also undergoes transformation, its penetrative power being diminished. Radioactive emanations are also changed when they are transmitted by solid substances.

T. H. P.

γ-Rays of Radium. Friedrich Paschen (*Chem. Centr.*, 1904, ii, 1101—1102; from *Physik. Zeit.*, 5, 563—568).—The photographic image obtained by means of γ-rays is not in any way affected by causing the rays to traverse an electric or magnetic field of 30,000 C.G.S. units or by opposing an *E.M.F.* of 7000 volts and reversing the strongest magnetic field. The ratio e/m must therefore be less than 1000, whilst for β-rays it is equal to 10^7. The shadows cast by two platinum wires placed one above the other in close proximity are displaced by less than 0·1 mm. in the direction corresponding with the negative charge. The secondary effects are almost entirely due to γ-rays. Since e/m is small and m is at least 40,000 times greater than in the case of β-rays, the energy of a γ-ray electron must be very great. Madame Curie found that the heat evolved by radium in an ice calorimeter was increased by about 4 per cent. when the radium was enclosed in an envelope of lead 2 mm. thick. The walls of the calorimeter absorbed about as much heat as the lead. From these data, it has been calculated that the γ-rays emitted by 1 gram of pure radium per hour are capable of producing 28 cals. if absorbed by lead. When lead was not used, the heat evolved by 1 gram of radium per hour was found to be 98·5 cals. In order to obtain an exact comparison, a calorimeter coated with lead of an average thickness of 1·92 cm. and a precisely similar calorimeter, but without the lead, were immersed in the same vessel containing ice and water. Fifty mg. of radium bromide were used. The contraction in the lead-covered calorimeter was found to be equal to 90 mg. of mercury per hour, but in the other to only 47. The γ-rays emitted by 1 gram of radium are able, therefore, to produce 126 cals. per hour, and the heat evolved is increased 2·26 times when these rays are absorbed. The energy of the β-rays of 1 gram of radium is less than 1·7 cals. per hour. The energy of a γ-electron is more than 3200 times greater than that of the most rapid β-electron in Kaufmann's measurements. E. W. W.

Slow Transformation Products of Radium. ERNEST RUTHERFORD (*Phil. Mag.*, 1904, [vi], 8, 636—650).—The active deposit derived from the radium emanation undergoes three further rapid transformations (see this vol., ii, 223, and Bakerian Lecture, 1904), and the three corresponding products are now termed radium *A*, radium *B*, and radium *C*. The change $A \longrightarrow B$ is accompanied by α-rays alone, $B \longrightarrow C$ is a rayless change, while the further change of *C* gives rise to α-, β-, and γ-rays.

When metallic plates are exposed to the action of radium emanation, a residual activity is obtained on the plates, comprising both α- and β-rays, the latter being present in all cases in a very unusual proportion. The equality of the activity and the identity of the radiation from each plate show that the residual activity is due to changes of some material deposit on the plates, and that it cannot be ascribed to an action of the intense radiations. Further, while the β-ray activity of the above-mentioned residue remains constant, the α-ray activity gradually increases as time goes on, showing that the two types of rays arise from different products. The author's experiments further show that these two kinds of matter are (1) a product giving out only β-rays, which is soluble in sulphuric acid, but non-volatile at 1000°, and which is not deposited on bismuth; (2) a product giving out only α-rays, which is soluble in sulphuric acid, volatile at 1000°, and is deposited from a solution on bismuth.

As indicated above, the α-ray activity increases if the β-ray product is present, but it is found to remain sensibly constant if removed from the β-ray product by the action of a bismuth plate. Hence the β-ray product (radium *D*) is the parent of the α-ray product (radium *E*). The theory of two such successive changes is worked out, and thence with the experimental data available, it is estimated that the time necessary for half-transformation is in the case of *D* about 40 years, in the case of *E* about 1 year. The amounts of *D* and *E* in an old sample of radium chloride were found to be in good agreement with the values deduced from other data. These products, radium *D* and radium *E*, must be present in pitchblende, and the author regards it as possible that *D* is the same as Hoffmann's radiolead (compare Abstr., 1903, ii, 402), and as almost certain that *E* is the radioactive constituent in Marckwald's radiotellurium (Abstr., 1903, ii, 81, 733). The question also is considered whether radium *E* may not be identical with Madame Curie's polonium. The two substances have similar chemical properties, and although radium *E* appears to be less volatile, the author adopts the view that polonium contains the same radioactive constituent as radiotellurium, that is, the fifth disintegration product of radium.

The separation of radium *D* from pitchblende would be of scientific value, and experiments with this object are in progress. J. C. P.

Properties of Radium Salts. Orazio Rebuffat (*Rend. Accad. Sci. Fis. Mat. Napoli*, 1904, [iii], **10**, 133—134).—On vigorously rubbing a glass rod with a woollen cloth and approaching the finger to the rod, sparks are given off visible in the dark. If the experiment is made in the neighbourhood of a radium salt, the rod appears luminous all along the line of contact of the rod and cloth during the time the rubbing is taking place; if the finger is now rubbed along the rod, a luminous streak appears along the latter. The same phenomenon occurs when the rod is replaced by an evacuated glass tube.

If a sealed tube containing a radium salt and furnished with a tap is connected with an exhausted tube and the tap then opened, the previously exhausted tube will become luminous when rubbed with a woollen cloth, even after the lapse of several days. T. H. P.

Emanium. Friedrich Giesel (*Ber.*, 1904, **37**, 3963—3966).—The emanium of the author differs from Debierne's actinium in two points. The activity of the emanium induction sinks in 34·4 minutes to half its original value, whereas 40 minutes are required for the same effect with actinium. The three lines which characterise the author's preparation have not been found with actinium. The most marked of those lines has λ 4885·4, whilst the other lines have λ 5300 and λ 5909 respectively.

Debierne's original preparations contained active thorium, whilst the author's contained inactive lanthanum.

The emanation from emanium differs from that from radium, since it cannot be expelled by heating or dissolving the preparation. The increase of activity observed with emanium is ascribed to the formation of a solid, non-volatile substance.

An active emanium preparation, in the form of oxide, was dissolved in hydrochloric acid a year after its preparation, and the rare earths, together with emanium, were precipitated by ammonia and the filtrate evaporated. The product obtained from the filtrate, after the ammonium chloride had been removed by volatilisation, consisted chiefly of strontium chloride, and emitted β-rays and an emanation. When dissolved in water and filtered, the β-rays were still emitted and the solution was luminescent. When the strontium was precipitated as carbonate, the whole of the active substance was contained in the precipitate, the filtrate being inactive. When this precipitate was dissolved in hydrochloric acid and then electrolysed, a trace of a yellow deposit was formed at the cathode, which emitted α- and β-rays strongly, but no emanation could be detected. The platinum anode was also active, although no deposit could be seen on it; it caused a zinc sulphide screen to phosphoresce, although to a much less extent than did the cathode. After a day, the activity of both electrodes had practically vanished. Since the deposit on the cathode indicated the presence of a heavy metal, the solution containing strontium chloride was treated with hydrogen sulphide. A faint turbidity resulted, and the solution was filtered. Although nothing could be observed on the filter paper, the activity of the latter was very intense, and scarcely diminished in intensity after several weeks.

A. McK.

Electrical Conductivity of Sodium and Potassium Chlorides in Mixtures of Water and Ethyl Alcohol. BERNHARD SCHAPIRE (*Zeit. physikal. Chem.*, 1904, **49**, 513—541. Compare Roth, Abstr., 1903, ii, 126).—The alcoholic mixtures used contained respectively 10, 20, 25, 30, and 40 per cent. by volume of alcohol in the case of sodium chloride, 20, 30, and 40 per cent. in the case of potassium chloride. The measurements were carried out at the temperature of 18°.

The addition of alcohol to water lowers the equivalent conductivity of both salts, but the lowering for 1 per cent. of alcohol is not so great for the later additions of alcohol as it is for the first additions. The experimental values of the conductivity are satisfactorily reproduced by Kohlrausch's formula, $(\Lambda_{\infty} - \Lambda)/\Lambda^{p} = c\eta^{\frac{1}{2}}$ (Abstr., 1901, ii, 221). In the case of sodium chloride, the value of p decreases from 10 per cent. alcohol, has a minimum for 25 per cent. alcohol, and thereafter increases; the variation of c with the percentage of alcohol is exactly the reverse. In the case of potassium chloride, p increases with the concentration of the alcohol up to 25 per cent., after which it falls off; the variation of c is again the reverse. For both chlorides, Λ_{∞} diminishes regularly as the alcohol concentration increases. For a given alcoholic mixture, the ratio $\Lambda_{H_2O}/\Lambda_{\text{alc.}}$ diminishes as the dilution increases, and is not constant even in the most dilute solutions investigated. The conclusion drawn from this is that the mobility of the ions and the degree of dissociation are both diminished by addition of alcohol. The temperature coefficient of conductivity increases markedly with increase of the alcohol concentration, and for a given alcoholic mixture increases slowly with diminishing concentration of the chloride.

Wakeman's formula (*Ann. Phys. Chem.*, 1893, ii, 49) is found to apply satisfactorily in all cases, and Arrhenius's formula (Abstr., 1892, 1038) is valid up to 10 per cent. alcoholic mixtures.

When Λ/Λ_{∞} is taken as a measure of the dissociation, it is found that of the three expressions for the dissociation constant, due respectively to Ostwald, Rudolphi, and van't Hoff, none gives satisfactory results. It appears also that the transport number for the cathion increases regularly as the alcohol concentration increases.

J. C. P.

Electromotive Forces produced at the Surface of Animal Membranes on Contact with Various Electrolytes. Gino Galeotti (*Zeit. physikal. Chem.*, 1904, 49, 542—562. Compare Abstr., 1902, ii, 377).—The fresh skin of a frog is in general the source of a potential difference when in contact with various electrolytic solutions; if the membrane, however, is killed, the potential difference can no longer be detected. The magnitude and direction of the *E.M.F.* produced depend chiefly on the nature of the electrolytic solution with which the membrane is in contact. With potassium chloride, bromide, or iodide as electrolyte, no *E.M.F.* is produced, which shows that a frog's skin has no intrinsic bioelectric property. Planck's theory of the contact potential between dilute electrolytic solutions may be applied to the above phenomena, if it is assumed that the inner and outer layers are permeable in different degrees to the various kinds of ions. J. C. P.

Anodic Dissolution of Metals and their Passivity. Otto Sackur (*Zeit. Elektrochem.*, 1904, 10, 841—844).—Between any metal and any aqueous solution an equilibrium is supposed to be reached which in the case of a bivalent metal would be represented by the equation $Me + 2H^{\cdot} \rightleftarrows Me^{\cdot\cdot} + H_2$. A passive metal does not decompose water, and in that case the pressure of the hydrogen is less than one atmosphere. The metal cannot dissolve unless the hydrogen is removed. An increase in the concentration of the hydrogen ions in solution increases the pressure of the hydrogen in the equilibrium and may therefore enable it to be evolved in the gaseous condition. Hydrogen ions, therefore, always tend to diminish or destroy passivity. Among the anions, NO_3' and ClO_3' always induce passivity, Cl' and Br' destroy it, whilst SO_4'', CN', CNS', $C_2H_3O_2'$, and OH' occupy an intermediate position. The ease with which Cl or Br combines with hydrogen explains their action; the very slow depolarising action of NO_3' or ClO_3' may be due either to the very small concentration of the hydrogen (this would explain the passivity of platinum in all circumtances), or to the small contact action of the metal on the combination of oxygen and hydrogen. As far as can be seen from the few data available, metals which exert a considerable catalytic effect on this reaction never become passive (copper and silver, for example).

These views, of course, only apply to cases in which the passivity is not due to a film of oxide (iron in fused sodium hydroxide, aluminium); they apply, for example, to zinc, which does not precipitate copper from cyanide solutions, or nickel or cadmium from their nitrates, or ferrous iron from its sulphate. T. E.

Theory of Amphoteric Electrolytes. Georg Bredig (*Ber.*, 1904, 37, 4140).—A claim for priority (compare Johnston, this vol., i, 984). E. F. A.

Transport Number of Sulphuric Acid. Olin F. Tower (*J. Amer. Chem. Soc.*, 1904, 26, 1039—1065).—The apparatus used in this investigation has been described previously (Abstr., 1901, ii, 143). A plate of cadmium was employed as the anode and a platinum spiral as the cathode. The electrolysis was continued for two or three hours at a constant temperature, and the quantity of electricity was determined by means of a silver voltameter. The liquid was divided into five portions, one at the anode, one at the cathode, and three in the middle. The first portion was analysed by precipitating the sulphuric acid as barium sulphate, whilst the other four portions were titrated with potassium hydroxide solution. The experiments were made with *N*, *N*/2, *N*/5, *N*/10, *N*/20, and *N*/50 sulphuric acid at a temperature, in most cases, of 20°, but in some cases of 8° or 32°. The results are tabulated.

The accuracy of the determinations seems to increase as the concentration decreases to *N*/20, and then becomes less owing to disturbances caused by the manipulation of the solution and the flow of the current. The results obtained at a temperature of 20° show that the transport number first decreases with the concentration, and then increases especially between *N*/10 and *N*/20. No such increase is observed between the same concentrations at 8° and 32°, although an increase appears in these cases at *N*/50.

The transport numbers found at the different temperatures with the three most dilute solutions are sufficiently constant to indicate either that no HSO_4 ions exist beyond the *N*/10 concentration, or that some compensation takes place in the dissociation of ions possibly even more complex than HSO_4. The average value of the results gives 178·8 as the transport number of sulphuric acid in dilute solution at 20°. The temperature coefficient was found to be 1·1.

These results are compared with those of previous investigators, and agree best with those of Bein (Abstr., 1898, ii, 553).

The values obtained by Jones and Douglas (Abstr., 1902, ii, 59) for the equivalent conductivity of dissociated sulphuric acid are probably much too low. It is shown that the migration number of the HSO_4 ion at 18° is 70, the value which has been adopted by Kohlrausch. Combining this with the transport number of sulphuric acid, the equivalent conductivity of sulphuric acid at 18° is found to be 396, and the migration number of the H ion, 326 at the same temperature. Noyes and Sammet (Abstr., 1903, ii, 126) obtained the value 330 for the latter quantity from transference experiments with hydrochloric acid.

E. G.

Thermal Expansion of Dilute Solutions of Certain Hydroxides. By George A. Carse (*Proc. Roy. Soc. Edin.*, 1904, 25, 281—291).—The hydroxides studied were those of sodium, barium, and strontium. When sodium hydroxide is dissolved in excess of water at 15°, contraction takes place, increasing until the concentration of the hydroxide is 6·07 per cent.; at that point the contraction has reached its maximum (0·0044 c.c. per gram of solution), and thereafter diminishes, passing into an expansion about the concentration 12 per cent. of hydroxide. At higher temperatures, the maximum contraction is less, and shifts in the direction of smaller hydroxide concentrations. All the barium hydroxide solutions examined exhibit a contraction, the character of which is not much affected by change of temperature.

Solutions of strontium hydroxide also exhibit a contraction which diminishes as the temperature of mixture rises.

Adopting the thermal expansion formula $V_t = V_{15}[1 + a(t-15) + b(t-15)^2 + c(t-15)^3]$, the author has evaluated the constants a, b, and c from his experiments, and shows that the volume at any temperature between 15° and 20° may be correctly calculated to within 5 units in the fifth decimal place. The foregoing formula was also used for the calculation of the expansion coefficients $a_t = 1/v_t . dv_t/dt$. J. C. P.

Latent Heat of Mixing for Associating Solvents. JOHANNES J. VAN LAAR (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 7, 174—177).—To obtain an expression for the latent heat of mixing of a substance with an associated solvent such as water, it is necessary to take into account the change in the degree of association of the solvent. It is calculated that for dilute solutions the change in the degree of association of the water molecules results in the absorption of 325 cals. when 1 gram-molecule of a non-electrolyte is dissolved and of 325 i cals. for each gram-molecule of an electrolyte. This quantity of heat must be subtracted from the experimentally determined heat absorption in order to obtain the pure heat of mixing. H. M. D.

Properties of Mixtures. Melting Points of some Mixtures of Sugars. HENRI GILLOT (*Bull. Acad. Roy. Belg.*, 1904, 834—854).—The author has constructed a series of curves showing the relationship between melting point and percentage composition for a number of mixtures containing mannitol, dulcitol, dextrose, sucrose, and lactose in pairs. The results show that the melting point of a mixture of any two of these substances is never exactly the mean of the melting points of the two constituents, and that the addition of minute quantities of one sugar to another lowers the melting point of the latter even when the substance added is of higher melting point. The forms of the curves obtained show that, in all the mixtures examined, with the exception of the sucrose—lactose and sucrose—dulcitol pairs, definite compounds are formed between the two constituents. The sucrose—dulcitol curve shows three branches which may be due to the formation of isomorphous mixtures (compare Le Chatelier, Abstr., 1894, ii, 179 and 223). T. A. H.

Molecular Elevation of the Boiling Point of Mixtures of Volatile Liquids. CHARLES MARIE (*Compt. rend.*, 1904, 139, 595—597).—The author has determined the molecular elevation of the boiling point of mixtures of alcohol and water containing resorcinol, which is soluble in each constituent; or benzophenone, acetophenone, naphthylamine, or phenyl benzoate, which are only soluble in alcohol; or alanine or asparagine, which are only soluble in water; and finds that the experimental values do not agree with the theoretical values calculated from Nernst's formula (*Zeit. physikal. Chem.*, 1893, 11, 1). Mixtures of the first type give results which are higher than the theoretical; mixtures of the second type give the same value for the molecular elevation of the boiling point of alcohol and water as for pure alcohol, whilst mixtures of the third type show a depression of the boiling point. M. A. W.

Heats of Combustion of some Organic Compounds. PAUL LEMOULT (*Compt. rend.*, 1904, **139**, 633—635).—By means of a table the author shows the close agreement between the experimental values obtained by Fischer and Wrede (compare this vol., ii, 468) for the heats of combustion of 35 organic compounds, and the corresponding values calculated from his own formula (compare Abstr., 1903, ii, 410; this vol., ii, 12, 310, 382, 605). M. A. W.

An Electrically Heated and Controlled Thermostat. R. H. MACUMBER and CHARLES G. L. WOLF (*J. Pathol. Bacteriol.*, 1904, **10**, 105—110).—The thermostat described and figured gives excellent results. The temperature is maintained by electrical heating, and the regulator produces much more constant temperatures than in gas-heated apparatus. W. D. H.

Changes of Density caused by Passage through Draw-plates. GEORG W. A. KAHLBAUM (*J. Chim. phys.*, 1904, **2**, 537—548).—It is impossible to give a definite value for the density of a metal; any value, however carefully determined, refers solely to the particular specimen employed. The author has determined the density of platinum wire before and after drawing through drawplates of diameters 0·7 mm. and 0·4 mm. The wire was at first 1 mm. in diameter. After its density had been determined, it was raised to a white heat for 3 minutes, allowed to cool, and the density again determined. It was then cold-drawn and the operations repeated. The six values so obtained for the density were, (1) 21·4136, (2) 21·4314, (3) 21·4181, (4) 21·4314, (5) 21·4142, (6) 21·4308. Two other specimens which at first had densities 21·4226 and 21·4233 ultimately gave values 21·4310 and 21·4317. These results show that, as indicated by previous observations, great compression produces a diminution of density, whilst heating then produces an increase of density; the values after this treatment seem to tend to a constant value. The experiments are being continued. L. M. J.

Viscosity of Liquid Mixtures. ALBERT E. DUNSTAN (*Zeit. physikal. Chem.*, 1904, **49**, 590—596).—In continuation of work previously described (Proc., 1903, 215; 1904, 117), mixtures of ethyl alcohol and carbon disulphide, ethyl alcohol and mercaptan, ethyl alcohol and acetone have been found to behave normally. The viscosity-concentration curve for ethyl alcohol and benzaldehyde resembles that for benzene and ethyl alcohol (*loc. cit.*) in exhibiting a minimum. Maxima are found to occur, not only for ethyl alcohol and water (*loc. cit.*), but also for (1) methyl alcohol and water and (2) acetic acid and water.

J. C. P.

Viscosity of Solutions in relation to the Constitution of the Dissolved Substance. ARTHUR A. BLANCHARD (*J. Amer. Chem. Soc.*, 1904, **26**, 1315—1339).—The relations between the velocity of migration of various elementary ions and the viscosity of solutions of their salts have been studied by Wagner (Abstr., 1890, 441) and Euler (*Zeit. physikal. Chem.*, 1898, **25**, 239). Euler has found that in the alkali metal series, as the atomic weight decreases, the rate of migration of the ion also decreases, whilst the viscosity increases. To account for this, it is suggested that the lower the atomic weight of the alkali metal, the greater is the tendency of its ion to unite with the solvent.

The viscosity of solutions of ammonia and pyridine in water at 25° and of water in alcohol at the same temperature has been determined and the results are tabulated. In calculating the viscosity of these solutions the linear formula was employed, and a correction was applied for the amount of solvent displaced by the dissolved substance.

The viscosities were also determined of solutions of silver nitrate, copper nitrate and sulphate, and zinc sulphate and chloride to which varying amounts of ammonia had been added. When sufficient ammonia was present to form the soluble metal ammonium compounds, a large decrease in the viscosity was observed; on the further addition of ammonia, the increase in the viscosity was nearly the same as would have been produced by the addition of the same quantity of ammonia to pure water. The results of these experiments have been plotted as curves from the form of which the composition of the complex existing in the solution can be inferred. The decrease of viscosity on the addition of ammonia to solutions of metallic salts is compared with the negative viscosity of certain solutions, and it is shown that both are capable of explanation on the assumption that the ions exist in combination with a certain number of molecules of the solvent.

Viscosity measurements were made to determine the effect of additions of water to solutions of alkali hydroxides and cupric chloride in ethyl alcohol. The results, although affording no very definite conclusions, support the suggestion already mentioned that the ions of the alkali metals of lower atomic weight are more highly associated with molecules of the solvent. In the case of copper chloride, a maximum of increase in viscosity was observed corresponding with the minimum of conductivity found by Jones and Lindsay (Abstr., 1903, ii, 55) and probably due to the same cause, namely, a maximum formation of highly associated molecules. E. G.

Thickness of the Capillary Film between the Homogeneous Phases of Liquid and Vapour and its Relation to the Critical Phenomena. GERRIT BAKKER (*Zeit. physikal. Chem.*, 1904, **49**, 609—617. Compare Abstr., 1903, ii, 62).—The author's arguments lead to the view that the thickness of the capillary film becomes extremely great at temperatures just below the critical temperature. The temperature at which the meniscus vanishes is the temperature at which the capillary film has become too thick to permit the observation of a practically discontinuous refraction of the light.

J. C. P.

Px Curves of Mixtures of Acetone and Ethyl Ether and of Carbon Tetrachloride and Acetone at 0°. G. C. GERRITS (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 7, 162—173).—The connection between the vapour tension, the molecular concentration of the vapour and that of the liquid mixture has been determined. The composition of the vapour phase is calculated from the refractivity measured by Rayleigh's method. In the case of the mixture of acetone and ethyl ether there appears to be a maximum pressure in the neighbourhood of pure ethyl ether. The curve representing the partial pressure of the ether is convex to the axis of concentration from 0—66 per cent. of ethyl ether; at this point the curve changes its direction, and is concave to the axis from 66 to 100 per cent. of ethyl ether. The acetone partial pressure curve is always concave to the concentration axis. The relative concentration of the ethyl ether is always greater in the vapour phase than in the liquid phase.

In the case of mixtures of carbon tetrachloride and acetone, both partial pressure curves are always concave to the axis of concentration, and the vapour phase is always richer relatively in acetone than the liquid phase. H. M. D.

Derivation of the Formula which gives the Relation between the Concentration of Coexisting Phases for Binary Mixtures. JOHANNES D. VAN DER WAALS (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 7, 156—162).—A mathematical paper unsuitable for abstraction. H. M. D.

Van der Waals's ψ-Surface. IX. The Conditions of Coexistence of Binary Mixtures of Normal Substances according to the Law of Corresponding States. H. KAMERLINGH ONNES and C. ZAKRZEWSKI (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 7, 222—233).—A theoretical paper unsuitable for abstraction.
H. M. D.

Determination of the Conditions of Coexistence of Vapour and Liquid Phases of Mixtures of Gases at Low Temperatures. H. KAMERLINGH ONNES and C. ZAKRZEWSKI (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 7, 233—244).—An apparatus is described for determining the composition of the coexisting phases by measurement of the pressure and volume at the beginning and end of condensation for binary mixtures of known composition. It seems probable that this method is to be preferred to the method of separating portions of the two phases and analysing these by chemical or physical means, for, as a rule, the analysis of a gaseous mixture cannot be so accurately performed as the preparation of a mixture of definite composition, and it is difficult to ensure the removal of fair samples of the two phases for the purposes of analysis. The commencement of condensation is determined by observation of a reflecting surface platinised by heating strongly with platinic chloride in camomile oil. The end condensation pressure is measured by replacing the dew-point apparatus by a piezometer. H. M. D.

Small Ionic Concentrations. Fritz Haber (*Zeit. Elektrochem.*, 1904, 10, 773—776).—Continuing the discussion on this subject (this vol., ii, 607 and 713), the author holds that it is not allowable to assume the law of mass action in solutions which are thousands of times more dilute than those for which the law has been proved experimentally.

If, for example, the lantern of a lighthouse were to revolve so slowly that a given place were illuminated once only in a night, that place could not be said to be light; similarly, if an ion only "flashes out" for a moment in a solution once a day, that ion cannot be considered to have a real concentration in the solution.

The tendency to assume that instantaneous reactions are due to extremely minute quantities of ions is probably due to a failure to realise the enormous reaction velocities involved by the assumption. The velocity of a reaction is given by the product of the velocity constant (velocity at unit concentration) and the concentration. If the latter is very small, the former must be very large in order that the product shall be large; by considering the reciprocal of the velocity constant (that is, time required for unit quantity of reaction) and assuming the usual atomic dimensions, it is possible to compare reaction velocities with well known physical quantities such as the velocity of electricity. In this way it was shown (this vol., ii, 607) that the assumption that small ionic concentrations are responsible for rapid reactions leads to velocities so large as to be almost inconceivable.

These difficulties are avoided by supposing that all molecules are capable of reacting, the class of molecules which contain electrons (ions) reacting more rapidly than the others on account of the great mobility of the electrons, just as the hydrogen compounds of organic radicles react more rapidly than their alkyl or phenyl compounds. Hence if ions are present in considerable quantity the reaction will be mainly ionic; if they are present in minute quantity or absent (as in Kahlenberg's experiments) the reactions will take place, on the whole, between undissociated molecules. In either case, the reaction may appear to be "instantaneous," the means of observation not permitting degrees of rapidity in such cases to be distinguished.

T. E.

New Modes of Formation of Colloidal Solutions. Behaviour of the Latter towards Barium Sulphate. Ludwig Vanino and F. Hartl (*Ber.*, 1904, 37, 3620—3623).—*Aspergillus oryzæ* is a strong reducing agent, and is specially suited for the preparation of colloidal metals. A solution of gold chloride containing 0·01 gram in 100 c.c. of water, into which the mould was sown, assumed a blue colour after several days. The mould grows rapidly both in dilute and in concentrated solutions. Colloidal gold may also be obtained when an alcoholic solution of phosphorus is added to gold chloride.

Since Vanino has shown previously that the question as to whether the colour of a solution is due to a substance in solution or in suspension may be settled by shaking the solution with barium sulphate, the authors have examined the action of barium sulphate on various colloids, such as arsenic trisulphide, antimony sulphide, cadmium sulphide, copper sulphide, silver sulphide, and silver. Special precaution must be taken that the barium sulphate used is pure. Solutions of the cyanides of the heavy metals are particularly suitable for the preparation of colloidal sulphide solutions. The colloidal solutions examined were agitated with barium sulphate; since the filtered solutions were clear, the action of the barium sulphate was simply mechanical.

A colloidal gold solution is decolorised by long-continued shaking, during which various tints appear until all the gold is precipitated.

Colloidal solutions are regarded by the authors as containing solid particles in suspension. A. McK.

Migration of Colloids. W. R. Whitney and J. C. Blake (*J. Amer. Chem. Soc.*, 1904, **26**, 1339—1387).—The colloidal gold solutions used in the experiments described in this paper were prepared by the action of an ethereal solution of gold chloride on an aqueous solution of acetylene. Such solutions, even after prolonged dialysis with conductivity water, retain a constant conductivity five or six times as great as that of the water outside the dialyser.

Some of the solution was placed in a vertical tube closed at each end by means of goldbeaters' skin with which the electrodes were in contact. On passing the electric current, the gold migrated to the bottom, a colourless liquid being formed at the top and separated by an easily visible boundary from the coloured gold solution beneath. By observing the movements of this boundary, the rate of migration could be ascertained. The conductivity of the solutions is attributed to the presence of electrolytes associated with, or adsorbed by, the gold, since it is found that the conductivity is almost completely lost by repeatedly migrating the gold downwards on to the membrane of goldbeaters' skin and redissolving it in pure water.

The rate of migration has been determined for gold, platinum, silver, Prussian blue, ferric hydroxide, silicic acid, and gelatin. It has been found that the rate of migration of colloids is directly proportional to the potential gradient. In certain cases, a reverse effect takes place, consisting either in a sudden retardation of the downward movement of the boundary or in a reversal of its direction. The cause of this phenomenon is discussed.

For an account of the various experiments and the results obtained, the original must be consulted. E. G.

Determination and Calculation of Equilibria for Highly Dissociated Acids. Karl Drucker (*Zeit. physikal. Chem.*, 1904, **49**, 563—589. Compare Rothmund and Drucker, this vol., ii, 231).—From the dissociation constant obtained for picric acid (*loc. cit.*), the author deduces $\lambda_\infty = 342$, and hence $\mu_{H^\cdot} = 312$ at 18°. When this value, which is lower than that usually accepted, is taken as the basis of λ_∞ for bromoacetic, dichloroacetic, trichloroacetic, and $\alpha\alpha\beta$-trichlorobutyric acids, Ostwald's dilution law is satisfactorily fulfilled in some cases, but not in others.

An attempt has been made to determine the dissociation constants for strong or moderately strong acids by the aid of partition experiments, as for picric acid (see *loc. cit.*). In benzene, however, which has almost exclusively been used as the other liquid along with water, many acids are associated, and the necessity of determining the equilibrium between the simple and the complex molecules in benzene solution by freezing-point experiments somewhat diminishes the accuracy of the method. The equilibrium constants obtained are recorded in the following table: k is the dissociation constant of the acid in aqueous solution; x is the partition coefficient for the simple molecules between water and benzene (water and chloroform in the case of sulphurous acid); K is the association constant in benzene solution.

	k.	x.	K.
Trichloroacetic acid	0·2—0·4	17·8	33
Dichloroacetic acid	0·0515	20·6	5 ?
$\alpha\alpha\beta$-Trichlorobutyric acid ...	0·180	0·62	6·9
Sulphurous acid (1st stage)...	0·016	0·70	—

From conductivity and partition experiments with mixtures of two acids (picric and iodic acids, bromoacetic and hydrochloric acids, dichloroacetic and trichloroacetic acids, dichloroacetic and trichlorobutyric acids, dichloroacetic and hydrochloric acids, picric and hydrochloric acids, trichloroacetic and hydrochloric acids), deviations from the dilution law could be detected in all cases at high concentrations, but only in one case with certainty when the concentration of each acid was less than 0·02 normal. J. C. P.

The Function of Peroxydase in the Reaction between Hydrogen Peroxide and Hydriodic Acid. Alexis Bach (*Ber.*, 1904, 37, 3785—3800. Compare this vol., i, 542, 792).—The presence of oxydase from horse-radish roots increases the oxidising action of hydrogen peroxide on hydriodic acid. This increases, on the one hand, with the concentration of the peroxydase, on the other with the concentration of the hydrogen iodide up to a maximum, when the activity remains constant; and the conclusion is drawn that the three substances react with one another in definite proportions. For equal increases in activity, it has been found that the product of the concentrations of oxydase and hydrogen iodide is a constant, so that the activity of the peroxydase, that is, the ratio hydrogen peroxide | peroxydase is inversely proportional to the concentration of the peroxydase, but directly proportional to the concentration of the hydrogen iodide.

The increase in decomposition is also exactly proportional to the square root of the concentration of the hydrogen iodide. But with another specimen of peroxydase, it was found that, after the peroxydase maximum had been reached, the increase in the decomposition was directly proportional to the concentration of the hydrogen iodide.

It appears probable that different specimens of peroxydases contain different amounts of at least two distinct catalysers. Any generalisations drawn with regard to any specimen of a ferment can only be regarded as holding good for that special specimen. Peroxydase is only slowly acted on by iodine or by hydrogen peroxide, but in the presence of the two it is comparatively readily destroyed. In order to obtain the best results from any peroxydase, a given concentration of hydrions is essential; this may be accomplished either by the presence of excess of hydriodic acid or by the addition of free acetic acid.

An increase of temperature from 16° to 38° diminishes the increase in activity to a considerable extent. J. J. S.

Isomerisation. Maurice Delacre (*Bull. Acad. Roy. Belg.*, 1904, 950—954. Compare Abstr., 1902, i, 79).—The author divides the phenomena of isomerisation into two groups: (1) in which the action is complete and non-reversible, the resulting product being quite distinct from the initial one, and (2) in which it is incomplete and reversible, as in the formation of pinacolin (*loc. cit.*). In the second group, the product may be a mixture of two substances in chemical equilibrium. The author states that there is only a superficial resemblance between this and tautomerism. Incidentally it is pointed out that so far little attention has been given to proving rigorously the individuality of isomerides. T. A. H.

New Laboratory Apparatus. Rudolf L. Steinlen (*Chem. Zeit.*, 1904, **28**, 1051).—The glass valve previously described (this vol., ii, 722) is modified so that it can be used as a Bunsen valve, and, further, so as to serve as an automatic seal to a reduction flask.

L. de K.

Inorganic Chemistry.

Influence of Indifferent Ions on the Electrolytic Formation of Periodic Acid and its Salts. Erich Müller (*Zeit. Elektrochem.*, 1904, **10**, 753—756).—The influence of indifferent ions on the electrolytic oxidation of iodates to periodates in neutral solutions observed by the author (this vol., ii, 250) was difficult to follow quantitatively, owing to the simultaneous oxidation of the indifferent ions themselves. The author now observes that the presence of a fluoride increases the yield of periodate per ampere hour from almost nothing to about 30 per cent. of the theoretical quantity. It is found that the addition of hydrofluoric acid to a solution of iodic acid increases the difference of potential between the anode and a $N/10$ calomel electrode from about 1·8 volts to more than 2 volts. The influence of fluorine on anodic oxidation has already been observed by Skirrow (Abstr., 1903, ii, 69). The author has previously shown that iodate is oxidised to periodate at a lead peroxide anode, but the potential is some 0·4 volt below that required to produce the same effect at a platinum anode in presence of a fluoride. He concludes that in one case the reaction is brought about by decreasing the "chemical resistance," whilst in the other it is produced by increasing the anodic potential.

T. E.

Preparation of Persulphates. Erich Müller (*Zeit. Elektrochem.*, 1904, 10, 776—781).—The addition of hydrofluoric acid to a solution of potassium hydrogen sulphate very materially increases the yield of potassium persulphate which is obtainable by electrolysis (Abstr., 1902, ii, 450). The yield, calculated from the quantities of oxygen and hydrogen evolved during the electrolysis, is increased from some 50 per cent. of the theoretical quantity to nearly 80 per cent. by the addition of hydrofluoric acid. Platinum electrodes are used, the current density being 0·2 ampere per sq. cm. at the anode and about 1 ampere per sq. cm. at the cathode.

With one anode, however, the addition of hydrofluoric acid had no effect, the persulphate crystals clinging to its surface instead of falling to the bottom of the vessel. The reason of this peculiarity was not discovered, although it appeared to be connected with the roughness of the surface; a very smooth surface appears to give the best result.

Measurements of the anode potential show that the addition of the hydrofluoric acid causes a sudden and considerable rise in its value; the increased production of persulphate is doubtless intimately connected with this rise.

T. E.

Density of Nitrogen Monoxide and the Atomic Weight of Nitrogen. Philippe A. Guye and Alexandre Pintza (*Compt. rend.*, 1904, 139, 677—679).—The authors have redetermined the density of nitrogen monoxide, using the method employed by Pintza and Jaquerod (compare this vol., ii, 612), in the case of sulphur dioxide and oxygen, and obtain the value 1·97788 grams for the weight of a litre of the gas under normal conditions of temperature and pressure, a result which agrees closely with those obtained by Rayleigh (1·97745) and Leduc (1·97803). The atomic weight of nitrogen as calculated from this value by the method of density limits is 13·99, whereas the value 14·013 is obtained if the molecular weight of nitrogen monoxide is determined by comparing the densities of carbon dioxide and nitrogen monoxide under corresponding conditions, 12·005 being taken as the atomic weight of carbon. The results obtained by the authors and their colleagues for the atomic weight of nitrogen are summarised in the following table:

Method.	Atomic weight of nitrogen.
Density limits of nitrogen (compare Guye, this vol., ii, 475)	14·004
Gravimetric analysis of N_2O (compare Guye and Bogdan, this vol., ii, 557)	14·007
Volumetric analysis of N_2O (compare Jaquerod and Bogdan, this vol., ii, 557)	14·019
Ratio of densities $N_2O : CO_2$ (present paper)	14·013

The discrepancy between the mean value (N = 14·011) and the value adopted by the International Commission for Atomic Weights in the table for 1904 (N = 14·04) calls for a revision of the latter value.

M. A. W.

Trithio-oxyarsenic Acid. LeRoy W. McCay and William Foster (*Zeit. anorg. Chem.*, 1904, 41, 452—473. Compare this vol., ii, 253).—Sodium trithio-oxyarsenate, $Na_3AsOS_3,11H_2O$, is unstable, being acted on by light at the ordinary temperature with the probable formation of the thioarsenate and the dithio-oxyarsenate. *Sodium strontium trithio-oxyarsenate*, $NaSrAsOS_3,10H_2O$, prepared from strontium chloride and sodium trithio-oxyarsenate, forms white crystals which gradually become yellow. *Calcium trithio-oxyarsenate*, $Ca_3(AsOS_3)_2,20H_2O$, forms unstable needles. A *salt* with the possible composition $Ba_7Na_2As_5O_7S_{14},12H_2O$ is described. *Potassium trithio-oxyarsenate*, $K_3AsOS_3,7H_2O$, prepared by the addition of potassium hydroxide to magnesium trithio-oxyarsenate, is a yellow oil which crystallises at – 20°. *Potassium barium trithio-oxyarsenate*,

$$KBaAsOS_3,7H_2O,$$

forms yellow crystals.

By the action of solutions of weak bases or of dilute solutions of strong bases on a large excess of antimony pentasulphide, considerable amounts of trithio-oxyarsenic acid are produced. A. McK.

Preparation of Silicon and its Chloride. Arnold F. Holleman (*Proc. K. Akad. Wetensch. Amsterdam*, 1904, 7, 189—191. Compare Abstr., 1900, ii, 275).—When silicon fluoride vapour is passed over heated sodium, reaction takes place according to the equation: $4Na + SiF_4 = 4NaF + Si$. If excess of silicon fluoride is avoided, there is practically no formation of sodium silicofluoride. When boiled with water and dilute hydrochloric acid, the residue does not, however, consist of pure amorphous silicon, for only about 40 per cent. can be volatilised in a current of chlorine, the remainder consisting principally of silicon dioxide which has been formed in the extraction of the sodium fluoride.

If the crude product is not previously boiled with water, no trace of silicon chloride is formed on heating it in a current of chlorine. This is due to reaction taking place according to the equation: $Si + 2Cl_2 + 4NaF = SiF_4 + 4NaCl$.

When sodium is heated in silicon tetrachloride vapour, a violent reaction takes place, but the mass, after extraction with water, also contains about 30 per cent. of silica.

Crystalline silicon is readily obtained according to Kühne's method by covering a mixture of aluminium powder, sulphur, and fine sand in a Hessian crucible with a layer of magnesium powder and igniting by means of a Goldschmidt cartridge. Dilute hydrochloric acid extracts the aluminium sulphide from the residue, and crystalline silicon containing only 3 per cent. of products not volatile in chlorine is obtained. This method is recommended for the preparation of silicon chloride (compare this vol., ii, 331). H. M. D.

Reduction to Carbon of Chemically-combined Carbonic Acid. Electrochemical Changes with Solid Substances. Fritz Haber and Stanislaw Tolloczko (*Zeit. anorg. Chem.*, 1904, 41, 407—441).—Solid sodium hydroxide was fused in an iron dish; it was then cooled, and, as soon as it solidified, was electrolysed by a current of 0·15 ampere and 11 volts, and finally at 200° with 1 ampere and 5 volts. The yield of sodium was 39 to 46 per cent.

Barium chloride was electrolysed at a temperature 400° below its melting point. When barium carbonate is added to barium chloride, carbon is formed at the cathode in quantitative amount. By aid of sodium, barium carbonate is readily converted into oxide, whilst carbon separates. Barium chloride and barium carbonate were fused together in a nickel crucible, allowed to cool, and then electrolysed at 550—600°, the cathode consisting of iron, platinum, or graphite. Carbon separated in a dendritic form. The *E.M.F.* between 550° and 580° varied from 6 to 10·4 volts, whilst the current strength varied from 22 to 45×10^{-3} amperes. In the experiments with graphite electrodes, the latter were not attacked.

During the electrolysis of barium chloride in a Hempel furnace, carbon was formed at the cathode, owing probably to the action of carbon dioxide and oxygen present in the heating gases on barium chloride, a reaction which proceeds thus: $BaCl_2 + CO_2 + O = BaCO_3 + Cl_2 - 11850$ cal. The analogous reaction with calcium chloride, proceeding according to the equation $CaCl_2 + CO_2 + O = CaCO_3 + Cl_2 + 1550$ cal., was studied. Chlorine is also produced in an analogous manner by the action of carbon dioxide and oxygen on sodium chloride.

No carbon was obtained when barium chloride was electrolysed in an electric furnace at about 600° in an atmosphere of nitrogen.

For the formation of barium and nickel chlorides as products of the electrolysis of solid barium chloride with nickel anodes, a polarisation of 2·65 volts would be expected according to the equation: $Ba + NiCl_2 = BaCl_2 + Ni + 122400$ cal. The value 1·9 volts was found corresponding with the free energy of formation of solid barium chloride and nickel from the reaction $2BaCl + NiCl_2 = 2BaCl_2 + Ni$; the reaction $Ba + BaCl_2 = 2BaCl + 34600$ cal. corresponds with 0·7 volt.

Determinations of the *E.M.F.* of two solid Daniell cells, $PbCl_2/AgCl$, agreed with the calculated value 0·519 volt. A. McK.

Action of Bromine on Alkali Hydroxides and the Electrolysis of Alkali Bromides.

Horst Kretzschmar (*Zeit. Elektrochem.*, 1904, 10, 789—817).—The first product of the action of bromine on an alkali hydroxide is always a hypobromite, the reactions being $Br_2 + OH' \rightleftarrows HBrO + Br'$ and $HBrO + OH' \rightleftarrows BrO' + H_2O$. Solutions of alkali hypobromites are always hydrolysed to a considerable extent, and therefore contain free alkali, hypobromous acid, and bromine, unless there is a very large excess of alkali. Hypobromites are oxidised by free hypobromous acid to bromates, thus: $2HBrO + MBrO = MBrO_3 + 2HBr$. This reaction differs from the analogous reaction with hypochlorite in having a velocity constant about 100 times greater, and in the fact that it takes place in slightly alkaline solutions (owing to the hydrolysis of the hypobromites). Hypobromites and hypochlorites are nearly equally stable in solutions which contain more than 0·1 gram-molecule of alkali hydroxide per litre.

When a neutral solution of an alkali bromide is electrolysed, bromine is first formed at the anode; this bromine combines with the free alkali formed at the cathode, giving hypobromite, the concentration of which increases at first, but soon reaches a constant value owing to the hypobromite being converted into bromate as fast as it is formed. When the stationary condition is attained, about 9 per cent. of the current is used in evolving oxygen at a smooth platinum anode, but only about 1 per cent. at a platinised anode. The yield of bromate in the latter case is practically theoretical. The limiting concentration of hypobromite increases with increasing concentration of bromide, higher current density, and lower temperature.

In alkaline solutions, the phenomena are similar, but more oxygen is evolved.

In neutral or slightly alkaline solutions, the formation of bromate is regarded as being practically entirely a secondary reaction due to the oxidation of hypobromite by hypobromous acid, the evolution of oxygen being due to the discharge of hydroxyl ions. The concentration of the hydroxyl ions at the anode is determined by the equilibrium with bromine given at the beginning of the abstract. In presence of excess of alkali, the formation of bromate is mainly due to a primary oxidation of hypobromite by anodic oxygen, $NaOBr + 2O = NaBrO_3$. That this reaction really occurs was proved by the electrolysis of a solution of hypobromous acid; the two possible reactions at the anode are: $BrO' + 4OH' + 4F = BrO_3' + 2H_2O$ and $6BrO' + 3H_2O + 6F = 6H^{\cdot} + 2BrO_3' + 4Br' + 3O$. The second involves the formation of bromide at the anode; the experiments showed that none was produced, hence the direct formation of bromate at the anode takes place in accordance with the first equation, whereas the second represents the nature of the change in the case of chlorate (Abstr., 1902, ii, 642). T. E.

Electrolysis of Alkali Chlorides in presence of Fluorine Compounds. FRITZ FOERSTER and ERICH MÜLLER (*Zeit. Elektrochem.*, 1904, 10, 781—783).—With reference to a process recently patented for the production of chlorates by the electrolysis of a solution of an alkali chloride to which hydrofluoric acid has been added, it is shown that the fluorine has no specific action, the results being merely those obtained by electrolysing a solution made slightly acid by any other means. T. E.

Preparation of Pure Sodium Hydroxide for Laboratory Purposes. FRIEDRICH W. KÜSTER (*Zeit. anorg. Chem.*, 1904, 41, 474—476).—A large, flat-bottomed glass dish of about 50 cm. diameter is filled several centimetres deep with water. In the centre of this is placed a dish made of platinum, silver, or nickel, and capable of containing 500—1000 c.c., and above this, supported by a tripod, a funnel of nickel gauze in which lumps of clean sodium are placed. The funnel and the empty dish are covered with a bell jar (the diameter of which is smaller than that of the flat-bottomed vessel containing the water), which is supported on pieces of glass rod. The sodium is quickly acted on by the water vapour, the hydrogen formed escaping under the bell jar, and the sodium hydroxide formed gradually dropping into the dish under the nickel gauze. A. McK.

Action of Heat on Alkali Phosphates. A. Boidin (*Chem. Centr.*, 1904, ii, 1192; from *Bull. Assoc. Chim. Sucr. Dist.*, **22**, 112—116).—Disodium hydrogen phosphate, $Na_2HPO_4,12H_2O$, is readily decomposed, and the dialkali phosphates behave at high temperatures as if they were dissociated into monoalkali phosphates and alkali hydroxides. Disodium phosphate is basic towards litmus, but if uric acid, which is almost neutral to litmus, is added, the solution becomes acid owing to the formation of monosodium phosphate; the phosphate is also decomposed by carbon dioxide. The alkalinity of a solution of disodium phosphate appears to be dependent on the temperature; with phenolphthalein, it gives a rose coloration, which becomes purple if the solution is warmed, but on cooling it regains the original tint. The results of experiments on the titration of decinormal solutions of disodium phosphate with acid, using phenolphthalein as indicator, showed that as the temperature of the solution is raised, the quantity of acid required for neutralisation increases. The decomposition of the phosphate is complete at 135°, since the rotatory power of dextrose is decreased by a dilute solution at this temperature by the same amount as by sodium hydroxide solution, although in both cases the reducing power is not affected; lævulose is formed on fermentation and one-fifth of the dextrose is not attacked. The alkalinity of disodium hydrogen phosphate is less at 100°, and its effect on the rotatory power of dextrose is also less; like the corresponding potassium salt, however, it is strongly alkaline at this temperature.

E. W. W.

Colloidal Silver Salts. Carl Paal and Franz Voss (*Ber.*, 1904, **37**, 3862—3881. Compare Abstr., 1902, i, 653, ii, 500; this vol., ii, 180).—Colloidal silver salts may be prepared by the method previously described, using alkali protalbates or lysalbates. The latter may be advantageously prepared with a somewhat higher proportion of alkali by the prolonged action of alkali hydroxide on egg-albumin, the excess of hydroxide being removed by dialysis.

Colloidal silver carbonate, prepared by dissolving silver lysalbate or protalbate in sodium carbonate and dialysing, forms a white, opalescent solution, and on evaporation yields the hydrosol in glistening scales, slightly dark in colour owing to the formation of some silver hydrosol, and dissolving readily in water. The dry product may contain as much as 48 per cent. of silver carbonate. Sodium chloride does not precipitate the silver, but forms colloidal silver chloride on heating.

Colloidal silver phosphate, prepared in similar manner, forms a yellow, milky solution and yields the solid hydrosol in yellow, transparent scales on evaporation.

Colloidal silver sulphide may be prepared by dissolving silver protalbate or lysalbate in ammonium sulphide, and may be concentrated by precipitation with hydrochloric acid. The solid hydrosol forms black granules containing as much as 74·6 per cent. of silver sulphide insoluble in water, but dissolving readily in dilute alkali hydroxides or carbonates. The solution is black, appearing dark brown in thin layers (compare Winssinger, Abstr., 1888, 911).

The colloidal silver haloids are best prepared by the addition of sodium haloid to colloidal silver hydroxide obtained from silver lysalbate. The solutions are opalescent, and yield slightly coloured solid hydrosols containing as much as 90 per cent. of silver haloid, and dissolving readily in cold water. Nitric acid forms a precipitate, which is redissolved by sodium carbonate. Ammonia, potassium cyanide, or sodium thiosulphate destroys the opalescence, forming true solutions (compare Lottermoser, this vol., ii, 31; and Lobry de Bruyn, Abstr., 1900, ii, 136). C. H. D.

So-called Magnesium Peroxide. Otto Ruff and Emil Geisel (*Ber.*, 1904, **37**, 3683—3688. Compare D.R.-P. 107246).—Attempts have been made to prepare pure magnesium peroxide by the addition of pure sodium hydroxide to magnesium sulphate solution in the presence of hydrogen peroxide. Even when a large excess of the latter is used, the precipitate in the moist state has the ratio $MgO : O = 1 : 0·67$. Drying the precipitate reduces the proportion of peroxidic oxygen, and a product is obtained which has the composition MgO,MgO_2,aq. The dried product readily loses oxygen at 25° or 37°, and at atmospheric pressure, but even after 22 days the ratio $MgO : O$ was $1 : 0·39$, and the ratio appears to remain constant at $1 : 0·35$, corresponding roughly with the formula $MgO_2,3MgO,aq$.

The decomposition is more rapid in the presence of water. J. J. S.

Phosphorescent Zinc Sulphide. Willem P. Jorissen and Wilhelm E. Ringer (*Ber.*, 1904, **37**, 3983—3985).—The purer zinc sulphide is, the less tendency to phosphorescence does it show; the presence of traces of other metals increases the tendency to phosphorescence. The results obtained by Grüne (this vol., ii, 732) and by Hofmann and Ducca (this vol., ii, 690) are analogous to those obtained with the sulphides of the metals of the alkaline earths. A. McK.

Complex Zinc Salts. F. Kunschert (*Zeit. anorg. Chem.*, 1904, **41**, 337—358).—The condition of zinc and of copper in solutions of complex salts of those metals was investigated by Bodländer and Eberlein's method (this vol., ii, 401). For the electrometric investigation of the formulæ of the various complex salts, the electrode used was not made of the metal present in the complex ion but of some other metal not attacked during the experiments. Solutions of zinc in ammonium oxalate, potassium oxalate, sodium hydroxide, and potassium cyanide respectively were examined.

Concentrated solutions of ammonium and potassium oxalates contain the complex ion $Zn(C_2O_4)_3$; more dilute solutions contain the ion $Zn(C_2O_4)_2$. For the separation of zinc from solutions of oxalates, an *E.M.F.* is required corresponding with the formula $E = 1·006 - 0·029 \log D/(C_2O_4)^3$, where D is the concentration of the zinc salt and (C_2O_4) that of the simple oxalate ions in solution.

The stability constants of the complex $Zn(C_2O_4)_3$ ions is $1·4 \times 10^8$, and their free energy of formation from the single ions is 10900 cal. The solubility of zinc oxalate in water is 7×10^{-5}.

In alkaline solutions, zinc is present chiefly in the form of the ions ZnO_2'', which are partially hydrolysed into the ions $HZnO_2'$ and OH'.

The tension of zinc towards an alkali zincate solution is expressed by $E = 1{\cdot}130 - 0{\cdot}029 \log D/(OH)^4$ relatively to the normal hydrogen electrode, where D represents the concentration of the zincate and (OH) that of hydroxyl ions in gram-mols. per litre.

The stability constant of the complex $HZnO_2$ is $2{\cdot}5 \times 10^{12}$, and its free energy of formation from the single ions at 18° is 16,520 cal.

In cyanide solutions, the ions are $Zn(CN)_4$ and $Zn(CN)_3$.

The tension of zinc towards potassium cyanide solutions is expressed by $E = 1{\cdot}287 - 0{\cdot}029 \log D/(CN)^3$, where D represents the concentration of the dissolved zinc double salt and (CN) that of the cyanogen ions in gram-mols. per litre.

The stability constant of the complex $Zn(CN)_3$ is $3{\cdot}3 \times 10^{17}$, and its free energy of formation from the single ions at 18° is 23,300 cal.

A. McK.

Constitution of Lead-Tin Alloys. Otto Sackur (*Chem. Centr.*, 1904, ii, 1022; from *Arb. Kais. Ges.-A.*, **22**, 187—204).—The hypothesis that alloys of lead and tin consist of solid solutions which are not mutually soluble in all proportions is supported by the results obtained by determining the state of equilibrium when lead and tin are precipitated from solutions of their salts by means of their alloys. It has been found that lead in alloys containing more than 10 per cent. has the same solution tension as the pure metal, but when the quantity of lead is decreased the solution tension also falls. The solution tension of tin in alloys in which more than 3 per cent. is present is identical with that of the pure metal. The solubility of tin in solid lead is, therefore, less than that of lead in solid tin. The solid alloys probably consist of mixtures of saturated and unsaturated solid solutions of variable composition. E. W. W.

Solutions of Copper in Potassium Cyanide. F. Kunschert (*Zeit. anorg. Chem.*, 1904, **41**, 359—376. Compare preceding page).—Solutions of copper in potassium cyanide contain the ions $Cu(CN)_4'''$, and to a less extent the ions $Cu(CN)_3''$.

The tension of copper towards potassium cyanide solution is expressed by $E = 1{\cdot}130 - 0{\cdot}0575 \log D/(CN)^4$.

The stability constant of the copper cyanogen ion is 2×10^{27}, and its free energy of formation from the single ions is 36,300 cal., both those values being greater than those found for zinc. A. McK.

Electrolysis of Solutions of Copper Sulphate. Fritz Foerster and Giulo Coffetti (*Zeit. Elektrochem.*, 1904, **10**, 736—741).—Bose (Abstr., 1899, ii, 349) observed two cathodic decomposition points in solutions of cupric salts. The authors describe some experiments which show that at cathode potentials below the upper point cuprous oxide is deposited from neutral solutions of copper sulphate and cuprous sulphate is formed in acid solutions. The phenomena are best observed in hot solutions, because the concentration of the cuprous ions in equilibrium with cupric ions is greater at higher temperatures.

The observations are best explained by assuming that the reaction $Cu^{\cdot\cdot} - F = Cu^{\cdot}$ takes place at the cathode so long as the solution in contact with it contains less than the quantity of cuprous ions corresponding with the equilibrium $2Cu^{\cdot} \rightleftarrows Cu + Cu^{\cdot\cdot}$. Cuprous ions are constantly removed from the neutral solutions by hydrolysis (owing to which cuprous oxide is precipitated), and from acid solutions by oxidation by atmospheric oxygen. At a copper anode, similarly, the copper dissolves in the cuprous condition until equilibrium is attained, and since the layer of solution in contact with the anode always contains more cupric sulphate than the body of the solution, a greater number of cuprous ions will be formed there than can exist in the more dilute mass of the liquid, and therefore as the concentrated solution diffuses away from the anode copper must be deposited. This explains the fact that the loss of weight of the anode is greater than the gain of weight of the cathode, and also the presence of copper dust in the anode slime. T. E.

Reactions of Salts in Solutions other than Aqueous. Alexander Naumann [with Erich Alexander] (*Ber.*, 1904, **37**, 3600—3605).—The solubility of a large number of inorganic salts in ethyl acetate was examined qualitatively.

A saturated solution of mercuric chloride in ethyl acetate at 18° contains 1 gram of mercuric chloride to 3·5 grams of ethyl acetate; the action on it of stannous chloride, hydrogen sulphide, ammonia gas, and cadmium iodide was studied.

A saturated solution of cupric chloride in ethyl acetate at 18° contains 1 gram of cupric chloride to 249 grams of ethyl acetate. Its behaviour with ammonia, hydrogen sulphide, hydrogen chloride, stannous chloride, and cadmium iodide was studied. A. McK.

Stability and Solubility Relations of the Hydrates of Ceric Sulphate. Ivan Koppel (*Zeit. anorg. Chem.*, 1904, **41**, 377—406).—From determinations of the solubility of the hydrates $Ce_2(SO_4)_3,12H_2O$, $Ce_2(SO_4)_3,8H_2O$, and $Ce_2(SO_4)_3,5H_2O$, Muthmann and Rölig found (Abstr., 1898, ii, 376) that the dodecahydrate is stable between 0° and 27·5°, the octahydrate between 27·5° and 72°, and the pentahydrate between 72° and 100°; further, the solubility curves of the dodeca- and the octa-hydrates are concave towards the temperature axis, and the solubility of the octa- and penta-hydrates within ranges of temperature at which they are labile is smaller than that of the hydrates stable within the same ranges of temperature. The results of Muthmann and Rölig are, according to the author, incorrect.

The hydrate $Ce_2(SO_4)_3,12H_2O$, obtained by the slow evaporation of a concentrated solution of ceric sulphate over sulphuric acid at 0°, crystallises in tiny needles. The hydrate $Ce_2(SO_4)_3,9H_2O$, prepared by evaporation of a solution of ceric sulphate at 40—45°, separates in hexagonal prisms. The hydrate $Ce_2(SO_4)_3,8H_2O$ is best prepared by warming at 45—50° a solution of the anhydride of ceric sulphate which has previously been saturated at 0°. The existence of the hydrate $Ce_2(SO_4)_3,6H_2O$ is doubtful. The hydrate $Ce_2(SO_4)_3,5H_2O$ is best prepared by heating at 70—100° a solution of ceric sulphate which has previously been saturated at a low temperature; it forms monoclinic prisms. The hydrate $Ce_2(SO_4)_3,4H_2O$ is conveniently prepared by agitating the enneahydrate with a little water at 70° for about 48 hours, and then drying the mass at the same temperature.

The solubility in water at various temperatures of the various hydrates enumerated was determined. The results, which are depicted by curves, also indicate the stability relations of the hydrates.

A. McK.

The Atomic Weight of Aluminium. Émile Kohn-Abrest (*Compt. rend.*, 1904, **139**, 669—671).—The method previously employed (compare this vol., ii, 261) for the estimation of aluminium in aluminium powder, namely, weighing as water the hydrogen evolved by the action of dilute hydrochloric acid on a known weight of the powder, can conversely be used to determine the atomic weight of aluminium if pure aluminium or aluminium containing a known quantity of impurities is used; for this purpose, a specimen of aluminium containing 98·68 per cent. of the metal was dissolved in dilute hydrochloric acid (1 : 10), the hydrogen evolved was dried and passed over heated copper oxide, and the water collected and weighed in tubes filled with glass beads moistened with sulphuric acid. The atomic weight of aluminium as determined by this method (seven experiments) is 27·05 ($H = 1$, $O = 15·88$); and the value obtained by weighing the alumina formed from a known weight of aluminium is 27·09.

M. A. W.

Structure of Alloys. Part I. Aluminium Alloys. William Campbell (*J. Amer. Chem. Soc.*, 1904, **26**, 1290—1306).—A study of the alloys of aluminium with copper has led to the following conclusions. The series of alloys containing between 0 and 54 per cent. of copper has a eutectic point when about 32 per cent. of copper is present. In alloys containing 32—54 per cent. of copper, crystals of the compound Al_2Cu occur in the eutectic mass. As the proportion of copper increases beyond 54 per cent., the mass of the compound Al_2Cu gradually decreases, whilst a new constituent simultaneously increases until 78 per cent. of copper is present. It is uncertain whether this new constituent is $AlCu$, Al_2Cu_3, or $AlCu_2$. Alloys containing 83—90 per cent. of copper form solid solutions which at a lower temperature undergo a change, the nature of which depends on whether the alloy contains more or less than 87 per cent. of copper, this being the eutectoid point. Alloys containing between 92 and 100 per cent. of copper form solid solutions, isomorphous with copper, and undergo no rearrangement in the solid state.

The paper is illustrated with microphotographs.

E. G.

Electrolytic Iron. A. Skrabal (*Zeit. Elektrochem.*, 1904, **10**, 749—752).—Electrolytic iron of type *A* is white, compact, and extremely hard; it is obtained by electrolysing a solution of a ferrous salt with an iron anode and a small current density. Type *B* is greyer in colour, less compact, and softer than type *A*; it is obtained by using a platinum anode, a large current density, and a solution of some complex ferrous salt. Between these two extremes there is a series of intermediate qualities of iron obtained by combinations of the conditions mentioned. Iron of type *A* (obtained by electrolysing a solution of very pure ferrous ammonium sulphate with a platinum cathode, an anode of electrolytic iron, and an *E.M.F.* of about 0·4 volt) is silvery-white and sometimes distinctly crystalline. It dissolves very slowly in warm dilute sulphuric acid and rusts in moist air.

Occasionally specimens are obtained which are hardly attacked by acids or haloids. Type *A* iron is always very hard (it usually scratches glass) and brittle, but it loses these qualities when heated to redness. When the iron is exposed to air, it slowly loses hydrogen, or more rapidly when it is immersed in hot water; this loss of hydrogen does not diminish its hardness and brittleness. The author takes the view that electrolytic iron of type *A* is γ-iron; it is therefore in unstable equilibrium at the ordinary temperature. When heated, it changes into the stable α-iron, which is soft. It cannot be hardened by heating and sudden cooling owing to the high temperature at which γ-iron changes into the β-form in pure iron. The presence of large quantities of hydrogen is attributed to the greater solvent action of γ-iron, which is known to dissolve carbon much more readily than α-iron. T. E.

The Transformation Temperatures of Steels. GEORGES CHARPY and LOUIS GRENET (*Compt. rend.*, 1904, **139**, 567—568).—A comparison of the results obtained by the authors, by Boudouard (compare this vol., ii, 127, 262), and by Belloc in the determination of the transformation temperatures of steels, by the dilatometric, the electric resistance, and the thermoelectric methods respectively, shows that the thermoelectric and dilatometric methods give concordant results in the case of soft steels only, whilst the electric resistance and dilatometric methods give results which agree within the limits of experimental error. M. A. W.

Cobalt Chloride. WILLIAM OECHSNER DE CONINCK (*Bull. Acad. Roy. Belg.*, 1904, 832).—The solution of cobalt chloride in ethylene glycol exhibits a purplish-violet colour, but when exposed to sunlight for several weeks the solution develops a bluish-violet colour, although only the dihydrated salt can be isolated from it. This appears to support the view that hydrated cobalt salts may exist in several allotropic forms. T. A. H.

Synthesis of Sulphates by Spring's Process. WILLIAM OECHSNER DE CONINCK (*Bull. Acad. Roy. Belg.*, 1904, 833. Compare this vol., ii, 472).—Nickel and cobalt oxides were separately crushed in contact with sodium hydrogen sulphate in porcelain mortars. In each case, the corresponding sulphate was formed. Similarly, the hydrated uranium oxide, UO_3,H_2O, gave rise to the sulphate,

$$(UO_2)SO_4,3H_2O,$$

when crushed with either sodium or potassium hydrogen sulphate.

T. A. H.

Atomic Weight of Tungsten. Edgar F. Smith and Franz F. Exner (*J. Amer. Chem. Soc.*, 1904, 26, 1082—1086).—The atomic weight of tungsten has been determined in the following manner. A weighed quantity of pure tungsten hexachloride was placed in a crucible and treated with distilled water. At a temperature of 60°, the decomposition proceeded quietly with formation of the hydrated oxide. When the mass was dry, a few drops of strong nitric acid were added and afterwards removed by evaporation. The residue was ignited for half an hour at a dull red heat and allowed to cool in the desiccator. Seven series of experiments (including 27 determinations) were made, a different sample of the hexachloride being used in each. Other experiments (23 in number) were carried out in which pure tungsten, obtained by reducing the trioxide in an atmosphere of hydrogen, was reoxidised by ignition in contact with the air, and the resulting trioxide weighed. The results of all these experiments are tabulated. The mean atomic weight of tungsten obtained from the hexachloride experiments was 184·04, whilst that from the oxidation of the metal was 184·065, giving an average value of 184·05 ($O=16$; $Cl=35·45$). E. G.

Structure of Alloys. Part II. Certain Ternary Alloys of Tin and Antimony. William Campbell (*J. Amer. Chem. Soc.*, 1904, 26, 1306—1315).—The alloy composed of 25 per cent. of antimony and 75 per cent. of tin, which contains cubes of the compound SbSn distributed throughout its mass, was taken as a basis, and portions of it were alloyed with each of the following metals: lead, cadmium, bismuth, copper, silver, zinc, arsenic, and aluminium. The alloys produced can be divided into three groups according to their structure.

(1) In these alloys, cubes of the compound SbSn are imbedded in a ground mass of tin dendrites, surrounded by the eutectic alloy of tin and the third metal. This structure occurs with lead and bismuth.

(2) Cubes of the compound SbSn and crystals of a compound of tin and the third metal are formed in the eutectic alloy of the latter compound with the third metal. This structure is produced with copper and silver. When arsenic is the third metal, the ground mass is a solid solution of tin.

(3) A compound of antimony and the third metal is formed. In the case of aluminium, the ground mass consists of crystals of the eutectic alloy of this metal with tin. In the case of zinc, and probably also of cadmium, the ground mass consists of crystals of the compound SbSn and a solid solution rich in tin.

The paper is illustrated with microphotographs. E. G.

Stannic Compounds. Italo Bellucci and N. Parravano (*Atti R. Accad. Lincei*, 1904, [v], 13, ii, 307—314).—The apparently perfect analogy indicated by the formulæ of chlorostannic and chloroplatinic acids, which both crystallise with six molecules of water, is borne out by the chemical behaviour of the acids and of their salts, the stannic derivatives being, however, far less stable than the platinic ones.

Thus when the former is heated in a vacuum at 100° in presence of potassium hydroxide, it loses one molecule of hydrogen chloride, forming the bibasic pentachloroplatinic acid, whilst chlorostannic acid in a vacuum in presence of potassium hydroxide decomposes at the ordinary temperature, yielding stannic chloride; the latter change also proceeds slowly in the air.

Chlorostannic acid cannot be titrated, because, as is shown by conductivity measurements of its solutions to which increasing proportions of sodium hydroxide are added, it undergoes hydrolytic decomposition in solution. Chloroplatinic acid, on the other hand, is a strong bibasic acid. Potassium stannichloride is also instantaneously hydrolysed in dilute solutions, whilst the platinichloride withstands long boiling in aqueous solution without change.

T. H. P.

Constitution of the Stannates. Italo Bellucci and N. Parravano (*Atti R. Accad. Lincei*, 1904, [v], 13, ii, 324—331. Compare preceding abstract).—On heating crystallised sodium stannate, $Na_2SnO_3,3H_2O$, it loses its $3H_2O$, giving the anhydrous stannate, which does not dissolve unchanged in water and does not tend to take up water so as to form the original salt.

Contrary to the statements of various authors, crystallised potassium stannate (with $3H_2O$) cannot be completely dehydrated by heating, as it begins to decompose, forming potassium hydroxide and stannic acid, as soon as any water is evolved. The heating observed when the ignited salt is treated with water is due solely to the action of the latter on the potassium hydroxide.

These facts indicate that the three molecules of water associated with the molecule of an alkali stannate are not merely water of crystallisation, but are more intimately connected with the salt. The latter has probably a structure similar to that of the hexahydroxyplatinates, namely, $X_2Sn(OH)_6$.

Hexahydroxyplatinic acid, $H_2Pt(OH)_6$, is a stable compound and is reduced to platinic hydroxide only by heating for some time at 100°, whilst the corresponding hexahydroxystannic acid is very unstable and is converted into stannic hydroxide on exposure to the air.

That the stannates are really derivatives of hexahydroxystannic acid is confirmed by the fact that the insoluble compounds formed from them by double decomposition have the formula $X''Sn(OH)_6$.

T. H. P.

Preparation of Solid Titanous Chloride. Peter Spence & Sons (D.R.-P. 154542. Compare Polidori, Abstr., 1899, ii, 295).—Solid titanous chloride, $TiCl_3,6H_2O$, is most readily prepared by electrolysing a 25 per cent. solution of titanic chloride, employing a potential difference of 3—4 volts and a current density of 2 amperes per sq. dm., and evaporating under reduced pressure until the solution has a sp. gr. 1·5 at 60—70°, when crystals of titanous chloride separate on cooling, and a further quantity is obtained on concentrating the mother liquor.

C. H. D.

Extraction of Vanadium from Natural Lead Vanadate, and Preparation of some of its Alloys. H. Herrenschmidt (*Compt. rend.*, 1904, 139, 635—637).—The slag obtained on fusing lead vanadate from the Santa Marta mines, Spain, with sodium carbonate and carbon contains all the vanadium in the form of sodium vanadate mixed with sodium aluminate and silicate and iron oxide. It is separated as vanadic acid by oxidation in the fused state with atmospheric oxygen and subsequent extraction with boiling water and treatment with sulphuric acid.

Ferrovanadium, containing 33 per cent. of vanadium, is made by igniting in the electric furnace the precipitate obtained by mixing sodium vanadate, iron sulphate, and sodium carbonate in the requisite proportions.

Nickelvanadium containing 25 per cent. of vanadium is obtained by reducing a mixture of vanadic acid and nickel oxide. M. A. W.

Metallic Acids. Roy D. Hall (*J. Amer. Chem. Soc.*, 1904, **26**, 1235—1250).—The oxides of columbium and tantalum employed in this investigation were obtained from columbite. A specimen of this mineral from Haddam, Conn., had a sp. gr. 5·75 at 4° and, on analysis, gave the following results:

	Ta_2O_5,Cb_2O_5.	WO_3,SnO_2.	Fe_2O_3.	U_3O_8.	MnO.
I.	79·75	0·32	15·11	0·23	6·69
II.	79·49	0·32	15·09	0·24	5·83

The mineral was decomposed by means of strong sulphuric acid. On extracting with boiling water, the oxides of columbium and tantalum were left as a residue together with the oxides of silicon, titanium, tungsten, and tin. This residue was left for several days in contact with a solution of yellow ammonium sulphide. The remaining oxides were dissolved in hydrofluoric acid, and the tantalum and silicon were separated as the double potassium fluorides, the columbium being obtained in the later fractions as the double potassium fluoride and oxyfluoride. It was found that the treatment with ammonium sulphide did not remove the whole of the tin and tungsten. The oxides of columbium and tantalum, prepared from the double fluorides, were therefore fused with sodium carbonate and sulphur. On extracting with water, the columbium oxide remained in the form of an insoluble sodium hydrogen salt. By fusing this compound with potassium hydrogen sulphate and washing the product with boiling water, the columbium oxide was obtained free from tin and tungsten. The oxide was converted into potassium columbium oxyfluoride, which was purified from tantalum by heating it at 150—175° and afterwards dissolving it in water. By repeating this operation, the whole of the tantalum was separated as an insoluble residue. The potassium columbium oxyfluoride thus obtained was found to contain titanium. Smith has shown (Abstr., 1898, ii, 571) that sulphur monochloride dissolves the oxides of columbium, tantalum, and titanium forming crystalline compounds in the case of the first two metals and a liquid with the titanium. A study was made of these reactions with the hope of devising a satisfactory method for removing traces of titanium from columbium. It was found, however, that the titanium could not be separated completely in this way. Columbium oxide free from titanium was obtained eventually by repeated precipitation of a solution of the oxyfluoride with ammonium hydroxide, the titanium remaining in solution.

When titanium oxide is heated with sulphur monochloride at 200° for several hours in a sealed tube and the product is distilled, the titanium is volatilised, probably as the tetrachloride, and passes over with the sulphur monochloride. Oxide of columbium, under similar conditions, dissolves in the sulphur monochloride and, on cooling, the pentachloride separates in transparent, yellow prisms. On heating the product, the sulphur monochloride passes over first, and the columbium pentachloride distils at 220—235°. The chloride prepared in this way contains traces of sulphur monochloride, but can be purified by distillation in a current of chlorine. Tantalum pentachloride, prepared in a similar manner, forms nearly white crystals which melt to a pale yellow liquid.

The oxides of titanium, aluminium, and iron are readily converted into volatile chlorides when heated with sulphur monochloride, whilst the oxides of tungsten, vanadium, and molybdenum yield volatile oxychlorides. Oxides of zirconium and tin are changed to volatile chlorides, but require to be heated for a considerable time at a high temperature. Oxides of boron and silicon are not affected, but chromic oxide is slowly converted into the violet chloride.

The use of sulphur monochloride affords a convenient method for preparing the anhydrous chlorides of many elements, and also provides a means of separating those elements which form volatile chlorides from those forming non-volatile chlorides. Sulphur monochloride is also useful for effecting the decomposition of some of the most refractory minerals.

In the course of this investigation, the double potassium fluorides of titanium, zirconium, columbium, and tantalum were submitted to a series of comparative qualitative tests with various reagents, and the results are tabulated. E. G.

Removal of Oxygen by Platinum. EUGEN GOLDSTEIN (*Ber.*, 1904, 37, 4147—4148).—The power of platinum to absorb oxygen can be excellently demonstrated by melting a platinum wire, about 4 mm. thick, into a Geissler tube so as to project about 1 cm. Then on filling the tube with oxygen, and sparking, the platinum becomes white hot, and in about 2 minutes the oxygen is completely absorbed. E. F. A.

Mineralogical Chemistry.

Bournonite from Sardinia. DOMENICO LOVISATO (*Zeit. Kryst. Min.*, 1904, 40, 97; from *Rend. Accad. Lincei*, [v], 11, ii, 357—361).—A massive mineral, occurring with galena at the Argentiera della Nurra mine at Portotorres, is shown by the following analysis, by C. Rimatori, to be bournonite, and not tetrahedrite as formerly supposed :

S.	Sb.	As.	Pb.	Cu.	Fe.	Mn.	CaO,MgO.	Total.
19·14	20·70	trace	40·73	12·22	4·59	1·35	traces	98·73.

L. J. S.

[Augite] from Canale Monterano, Province Rome. FERRUCCIO ZAMBONINI (*Zeit. Kryst. Min.*, 1904, 40, 49—68).—A crystallographic description is given of various minerals (magnetite, melanite, yellow garnet, olivine, idocrase, biotite, various green pyroxenes, black augite, and sanidine) from the weathered tuffs of Canale Monterano near Bracciano. The black augite gave the following results on analysis :

SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	Na_2O.	H_2O.	Total.
50·88	1·02	5·36	1·21	4·67	trace	22·96	13·78	0·50	0·34	100·72.

L. J. S.

Physiological Chemistry.

Differences in Electrical Potential in Developing Eggs. IDA H. HYDE (*Amer. J. Physiol.*, 1904, 12, 241—275).—The experiments were made on the eggs of the turtle and of *Fundulus*, and were carried out in relation to the work of others on the influence of electrolytes and ions on development. A difference of electrical potential occurs, which increases as development progresses, between the animal and vegetative poles of the eggs. The *E.M.F.* so generated undergo periodic variations during the phases of segmentation, and are doubtless related to the unstable equilibrium of chromatin and other substances. The alterations and interactions of ions and their associated energies are accompaniments of the physical and chemical changes in the egg, and give expression to their tension action in the form of astral and spindle radiations. W. D. H.

Alkalinity of Blood. OTTO FOLIN (*Zeit. physiol. Chem.*, 1904, 43, 18—20).—The principle and results of the method adopted by Salkowski, and later by Salaskin, for estimating the alkalinity of the blood are disputed. W. D. H.

Blood Proteids. GUSTAV VON BERGMANN and LEO LANGSTEIN (*Beitr. chem. Physiol. Path.*, 1904, 6, 27—39).—In dogs killed in active digestion, the blood contains a variable percentage of nitrogen after the separation of the coagulable proteids by boiling, acidifying, and filtering. What this residual nitrogen is contained in is discussed. The statement is made that albumoses are contained in normal blood during digestion in small but appreciable and physiologically important quantities. W. D. H.

Action of Naphthalene-β-sulphonic Chloride on the Blood. GUSTAV VON BERGMANN (*Beitr. chem. Physiol. Path.*, 1904, 6, 40—43). —The possibility that some of the residual nitrogen of the blood (see preceding abstract) may be contained in amino-acids and polypeptides, which recent research has shown are of importance in the synthesis of the body proteids, led to an attempt to separate these substances by the use of naphthalene-β-sulphonic chloride. A compound was obtained which, on analysis, gives numbers which will not fit in with any known substance. The work is to be continued. W. D. H.

Diastases and Anti-diastases in Blood Serum. M. Ascoli and A. Bonfanti (*Zeit. physiol. Chem.*, 1904, 43, 156—164).—By immunising rabbits with pancreatin, an anti-substance against pancreatic diastase is obtained in the serum. The formation of the anti-diastase is, however, variable. By prolonged immunisation, the anti-diastase disappears. It exhibits a variable inhibitory action on the blood diastases of other species of animals, but not on that of the rabbit. In some of the rabbits so treated, the amylolytic action of the fresh blood-serum is lessened, but the diminution does not correspond with the amount of anti-amylase formed. W. D. H.

Oxygen Exchange of the Pancreas. Joseph Barcroft and Ernest H. Starling (*J. Physiol.*, 1904, 31, 491—496).—Pancreatic secretion is accompanied by an increased oxygen absorption from the blood by the pancreas. This is shown by examining the blood by the air-pump or by the ferricyanide method. This increased oxidation takes place irrespective of increased flow of blood through the organ. The normal oxidation of the pancreas is much greater than that of the body generally, and about the same as that of the submaxillary gland. W. D. H.

Alcohol as a Food. W. H. Goddard (*Lancet*, 1904, ii, 1132—1136).—From experiments on dogs, the conclusion is drawn that with moderate doses 95 per cent. of the alcohol given is made use of in the formation of simpler products and the simultaneous liberation of energy, that is, it plays the part of a food. But with increasing doses this number is reduced; in such circumstances, there is a partial failure of the animal body to utilise the amount administered, so that in the final experiments, when the drug was given in excess, nearly 50 per cent. of it was excreted unchanged. W. D. H.

Phosphorus Metabolism. Ludwig F. Meyer (*Zeit. physiol. Chem.*, 1904, 43, 1—10).—Experiments on dogs show that on a diet poor in phosphorus (powdered meat and white of egg) the proteid requirements of the organism are as completely met as in cases where phosphorised material is abundantly given. Proteid is put on even in cases where the phosphorus balance is negative. Any definite relationship between the excretion of nitrogen and phosphorus is absent. An increase of phosphorus (as phosphates) in the food leads to a retention of phosphorus in the body. W. D. H.

Feeding Experiments on Dogs without a Pancreas. Gustav Embden and H. Salomon (*Beitr. chem. Physiol. Path.*, 1904, 6, 63—67. Compare Abstr., 1902, ii, 677).—Alanine, as previously shown, given to dogs without a pancreas increases the output of sugar. The same is true for lactic acid, glycine, and asparagine. Urea produces diuresis, but no increase of the sugar excreted. W. D. H.

Auto-digestion of Pepsin. AMEDEO HERLITZKA (*Atti R. Accad. Lincei*, 1904, [v], 13, ii, 51—57).—In order to ascertain whether pepsin is a true proteid substance or only closely allied to the latter, the author has subjected a solution of carefully purified pepsin, which showed no biuret reaction, to a temperature of 40° in presence of 0·2 per cent. of hydrochloric acid. After remaining under these conditions for a period of from 11 to 40 hours, the solutions all gave the biuret reaction, so that peptone is formed from pepsin by auto-digestion. By experiments in which the pepsin solution acts on albumin, it is found that the auto-digestion coefficient increases as time goes on.

Hence one part of the pepsin acts on another with a peptonising action just as in a true auto-digestion, and pepsin is hence a true proteid. T. H. P.

Glycolysis. P. PORTIER (*Ann. Inst. Pasteur*, 1904, 18, 633—643).—In the presence of sufficient antiseptic (1 per cent. sodium fluoride), the expressed juice of various organs produces no glycolysis at 36° during two days' incubation. No glycolysis occurs during 2 to 3 hours' incubation, even if no antiseptic or only chloroform is added. The juice of organs rich in glycogen shows an increase of reducing power, owing to the action of the amylase and maltase of the tissues. Alcohol was never formed in appreciable quantities. The conclusions of Stoklasa and Simacek are disputed. W. D. H.

Hydrolysis of Fresh and Self-digested Glands. PHOEBUS A. LEVENE (*Amer. J. Physiol.*, 1904, 12, 276—296).—The cleavage products of proteids are different when the hydrolysis is carried out by acid and by autolysis. One explanation of this is found in the recent discoveries of arginase, guanase, and similar enzymes. In the present research, the pancreas, spleen, and liver were employed, both fresh and after autolysis, and the basic constituents examined after treatment with 5 per cent. sulphuric acid. The results with the pancreas are as follows: from the fresh glands, guanine and a smaller amount of adenine were formed; xanthine and hypoxanthine were absent, or nearly so. In the digested gland, the total purine bases were less, little guanine was found, no adenine, but appreciable amounts of xanthine and hypoxanthine. Among the pyrimidine bases, the fresh gland yielded uracil and cytosine, but no thymine; the digested gland yields uracil only. Of the hexon bases, arginine and lysine were obtained from the fresh gland, but not from the digested organ, their place being taken by tetramethylenediamine. Finally, the digested gland yields more ammonia than the fresh gland.

The results with the liver and spleen were very similar, but some differences of detail are noticed. W. D. H.

Detection of Guanidine amongst the Products of the Autodigestion of the Pancreas. FR. KUTSCHER and J. OTORI (*Zeit. physiol. Chem.*, 1904, 43, 93—108. Compare Abstr., 1903, i, 666).—The paper largely treats of the method for separating some of the various substances (histidine, arginine, guanidine) obtained as a result of pancreatic autodigestion. Considerable importance is attached to the discovery of guanidine among the products, because it is sometimes undoubtedly formed as the result of normal metabolic processes. W. D. H.

Autolysis of Ox Testis. JUNICHI MOCHIZUKI and Y. KOTAKE (*Zeit. physiol. Chem.*, 1904, **43**, 165—169).—Among the autolytic products separated and identified are ammonia, guanine (?), hypoxanthine, xanthine, thymine, lysine, and choline. Whether leucine and tyrosine are also present is to be the subject of further work.

W. D. H.

Formation of Acetone in the Body. GIUSEPPE SATTA (*Beitr. chem. Physiol. Path.*, 1904, **6**, 1—26).—In normal circumstances, small quantities of acetone leave the body in the excretions, but β-hydroxybutyric acid is absent. The latter substance is easily burnt in the healthy body, but it is not regarded as the usual source of the acetone. Numerous experiments with different diets on men are given; no regular relationship between ammonia and acetone formation was found. With absence of carbohydrate food, there is an increase in the excretion of ammonia and uric acid. Acetone formation is inhibited by giving the necessary amount of carbohydrates in the diet. In pneumonia, the acetone decreases and the nitrogen excretion increases. Details are also given of the conditions in other pathological cases. The source of acetone substances is discussed at length, and the conclusion reached is that it is not proteid or carbohydrate, but fat. W. D. H.

Formation of Sugar in Artificial Perfusion of the Glycogen-free Liver. GUSTAV EMBDEN (*Beitr. chem. Physiol. Path.*, 1904, **6**, 44—58).—The livers of dogs rendered free from glycogen by the administration of strychnine were perfused with either ox blood or dog's blood. An appreciable increase in the amount of sugar in the blood was noticeable in a few hours. If sugar is added to the blood beforehand, the same increase occurs. After a time, no further increase occurs; but if a fresh lot of blood is then used for perfusing, the same increase is repeated in that. What the substance is which gives rise to sugar is not yet discovered, but the source of the newly-formed sugar is probably both in the blood and the liver. W. D. H.

The Occurrence of a Volatile, Iodoform-forming Substance during Perfusion of the Liver. MARCO ALMAGIA and GUSTAV EMBDEN (*Beitr. chem. Physiol. Path.*, 1904, **6**, 59—62).—The blood used in the experiments described in the preceding abstract yielded on distillation a substance which yielded iodoform with iodine. It is not alcohol or aldehyde, but probably acetone; this, however, was not definitely proved. W. D. H.

The Nitrogenous Constituents of Flesh. HARRY S. GRINDLEY (*J. Amer. Chem. Soc.*, 1904, **26**, 1086—1107).—A considerable portion of raw meat is soluble in cold water; thus 12·14 of the total proteid and 22 per cent. of the total nitrogen are soluble. The nitrogen in such extracts is about equally divided between proteid and non-proteid substances. The acidity of a solution of flesh increases on the coagulation of its proteids. The proteids of cooked meats are much less soluble in cold water and 10 per cent. solution of sodium chloride. In 0·15 per cent. hydrochloric acid, the solubility in the two cases is about equal; in 0·15 per cent. solution of potassium hydroxide, the cooked proteids are more soluble. Hot water removes from raw meat 0·49 per cent. of proteid, and from boiled meat 6·2 per cent. All these conclusions are founded upon numerous analyses. The nature of the proteid matter in the different extracts has not yet been investigated. W. D. H.

Serosamucin. GUSTAF VON HOLST (*Zeit. physiol. Chem.*, 1904, **43**, 145—155).—*Serosamucin* is the name given to the mucinoid substance which is present in many cases of ascitic fluid. The mucinoid material of synovia may be mixed with nucleo-proteid from the cells, but is a true mucin, having a composition practically identical with that of serosamucin. It is free from phosphorus. W. D. H.

Osmotic Pressure of Proteids. E. WAYMOUTH REID (*J. Physiol.*, 1904, **31**, 438—463).—The osmotic pressure of serum and egg-white per unit concentration of proteid varies in different samples. The same variability is exhibited by solutions of the proteids salted out and dialysed, or crystallised from these fluids. By washing the salted-out or crystallised proteids, solutions of proteids are obtained which give no osmotic pressure. Non-proteid substances in the washings have an osmotic pressure. The presence of osmotic pressure-free proteids in the membrane is necessary to render it impermeable to these substances. Proteid-metabolites produced by bacterial growth will impart osmotic pressure to solutions of proteids previously giving none; this can be again reduced by washing. W. D. H.

The Physiological Significance of Colloids. RUDOLF HÖBER and DORA GORDON (*Beitr. chem. Physiol. Path.*, 1904, **5**, 432—441).—Experiments similar to those described by Freundlich (Abstr., 1903, ii, 533) have been made by adding electrolytes at different rates to such colloidal solutions as egg-albumin or gelatin, and Freundlich's results confirmed. This in conjunction with the Bois-Raymond law of electric excitation of nerves is considered to indicate that the transportation of ions to the excited object (the "plasmahaut") is probably the cause of excitation.

It is shown that the colloid of the "plasmahaut," namely, lecithin, can be narcotised by chloroform, ether, amyl alcohol, &c. Linder and Picton's conclusions (Trans., 1895, **67**, 63) as to the mutual retardation of univalent and bivalent cathions on the precipitation of arsenious sulphide are confirmed. The anions have no effect; two cathions of the same valency have an effect equal to the sum of the two separate ions, but the effect of two cathions of different valencies is less than the sum of the effects of the two individual ions.

J. J. S.

Tyrosinase of Lucilia Cæsar. C. GESSARD (*Compt. rend.*, 1904, **139**, 644—645).—Both tyrosinase and tyrosine can be detected in the larva of *Lucilia Cæsar*, and the larval covering or skin of the nymph, at first white, becomes black owing to the oxidising action of the tyrosinase on the tyrosine; if, however, the white pupæ are kept in a vacuum, the oxydase is inoperative, and no coloration is developed; similar results are obtained with the insects, which are colourless at first and develop a metallic golden-green lustre in the air but remain colourless in a vacuum. M. A. W.

Heat Contraction in Nerve. T. GREGOR BRODIE and WILLIAM D. HALLIBURTON (*J. Physiol.*, 1904, **31**, 473—490).—When a nerve is heated, it shortens very considerably; this is especially the case with frogs' nerves. The same is true for the spinal cord. The shortening as in muscle occurs in a series of steps, and the temperatures at which these successive contractions occur coincide with the coagulation temperatures of the proteids contained in saline extracts of nervous tissues. Special interest attaches to the first step in the contraction; in the frog this occurs at 39—40°; in the mammal, at 47—49°; and in the bird, at 50—53°. A small amount of slow contraction occurs a few degrees below those just mentioned; this corresponds with the stage of opalescence when a proteid solution is gradually heated. The temperatures of the first contraction in nerve or spinal cord correspond closely with those in muscle. They further coincide with those in liver, the method being applicable to tissues like the liver, even although the histological elements have no longitudinal arrangement. The death temperature of muscle is that at which the first proteid coagulates; the same is true for nervous tissues; conduction and electrical response are abolished then. These facts indicate a biological adaptation of the tissue proteids of animals in relation to their normal temperatures, and to the rise of temperature to which they may be safely subjected. W. D. H.

Decapsulation of the Kidney. ISAAC LEVIN (*Amer. J. Physiol.*, 1904, **12**, 304—309).—Removal of the kidney capsule for various kinds of kidney disease is now a frequent surgical proceeding, which is stated to result in benefit. The function of the capsule is unknown. It is suggested that it may be protective against noxious agents, and that the benefit of decapsulation may be counterbalanced by injury due to depriving the kidney of its covering. By the oncometric method, it was found that any stimulus which, like adrenaline, raises the general blood pressure, or like vagus excitation weakens the cardiac force, diminishes the size of the kidney. This effect is greater on a decapsulated kidney than on a normal one, and lasts longer. The capsule acts like an elastic covering, preventing undue filling of the organ with blood. Decapsulation does not apparently injure the renal nerves. W. D. H.

The Bile of Polar Animals. II. The Bile of the Musk Ox. OLOF HAMMARSTEN (*Zeit. physiol. Chem.*, 1904, **43**, 109—126. Compare Abstr., 1903, ii, 86).—The bile of the musk ox contains glyco-

cholic acid, glycocholeic acid, and taurocholic acid. The methods of separation and identification of these substances are given in detail.
W. D. H.

The Power of the Liver to Destroy Diphtheria Toxin. T. Lauder Brunton and T. J. Bokenham (*J. Pathol. Bacteriol.*, 1904, **10**, 50—55).—The liver has the power of diminishing the lethal action of the diphtheria toxin when this is circulated through it, either alone or mixed with blood. In such circumstances, the bile acquires a certain amount of antitoxic power; the juice expressed from the liver has the same power, and the nucleo-proteid separated from the juice has marked antitoxic activity.
W. D. H.

Chemical Theories of Immunity. Jules Bordet (*Ann. Inst. Pasteur,* 1904, **18**, 593—632).—A full account of the author's views on the chemical theories of immunity and the properties of *antisensibilisatrices*. The experiments recorded mainly relate to hæmolysis. Ehrlich's view that specific auto-substances are identical with the cellular receptors is disputed.
W. D. H.

A Case of Pentosuria with Excretion of Optically Active Arabinose. Riccardo Luzzatto (*Beitr. chem. Physiol. Path.*, 1904, **6**, 87—91).—A curious case of *l*-arabinosuria is recorded; this condition, like the more common *r*-arabinosuria, is not a disease, but an anomaly of intermediate metabolism; those who exhibit it enjoy perfect health.
W. D. H.

Action of Adrenaline on the Bladder. T. R. Elliott (*Proc. physiol. Soc.*, 1904, lix; *J. Physiol.*, **31**).—The bladder of the cat is fully, and that of the monkey weakly, inhibited by adrenaline; those of the dog, rabbit, and mongoose exhibit no change; that of the ferret is contracted. The response of each bladder to excitation of the hypogastric nerve is identical with that caused by adrenaline. These facts confirm the hypothesis originally put forward by Brodie that adrenaline acts by stimulating sympathetic nerve-endings.
W. D. H.

A Group of Therapeutically Active Acid Amides. G. Fuchs (*Zeit. angew. Chem.*, **17**, (xl), 1505—1509).—A discussion, with a review of previous work, on the relative value of the halogen atom, and of the ethyl, hydroxyl, and other groups in various anæsthetics and hypnotics.

Experiments on animals are recorded concerning the sedative action of bromodiethylacetamide (neuronal), bromoethylpropylacetamide, and bromodipropylacetamide. The first named is the most efficacious, and is highly recommended in epilepsy.
W. D. H.

Effect of Intravenous Injections of Sodium Cinnamate. Frank Charteris and E. Provan Cathcart (*J. Pathol. Bacteriol.*, 1904, **10**, 56—59).—Sodium cinnamate given intravenously causes a slight permanent increase of mono-nuclear leucocytes. There are no changes in the marrow, and the slight changes seen in the spleen point to stimulation of that organ. W. D. H.

Action of Pituitary Extracts on the Frog's Circulatory System. Percy T. Herring (*J. Physiol.*, 1904, 31, 429—437).—Extracts of the infundibular portion of the pituitary body cause acceleration and augmentation when perfused through the isolated frog-ventricle. Strong extracts cause tonic contraction of the ventricle. If the extract is injected intravenously in a pithed frog, the heart-beat is slowed and diminished. This is abolished by atropine; after atropine, acceleration and augmentation are produced by the injection. This is attributed to the presence in the extract of two substances or groups of substances, one of which stimulates the intrinsic inhibitory nervous mechanism of the heart, the other the intrinsic accelerator mechanism; the action on the former alone is abolished by atropine. The extract also causes vaso-constriction, and as this action is abolished by apocodeine, it is attributed to stimulation of vaso-constrictor nerves. W. D. H.

Antitryptic Action of Serum. E. Provan Cathcart (*J. Physiol.*, 1904, 31, 497—506).—The antitryptic action of normal serum is associated with the albumin fraction. Globulins do not possess it, and are, moreover, very slowly attacked by the enzyme. The auto-action is effective with all varieties of proteid. Absolute specificity does not exist, and the existence of partial specificity is questionable. Heating the albumin to 55° for half an hour largely destroys its antitryptic activity, but the antitryptic action of the serum itself is more resistant to heat. Solutions do not deteriorate rapidly, and drying and dialysis have little or no destructive influence.

W. D. H.

Chemistry of Vegetable Physiology and Agriculture.

The Rôle of Microbes in Alcoholic Fermentation attributed to Zymase. Pierre Mazé and A. Perrier (*Ann. Inst. Pasteur*, 1904, 18, 382—384).—Vegetable extracts, fresh or fermented, and fresh animal extracts to which sugar has been added undergo the alcoholic fermentation; this, however, is not due to a zymase furnished by the cells, as Stoklasa considers, but to various micro-organisms, which, although admittedly present in Stoklasa's experiments, were stated by him to be incapable of producing the fermentation.

W. D. H.

Coagulation of Milk by Bacillus Coli Communis. William G. Savage (*J. Pathol. Bacteriol.*, 1904, 10, 90—97).—Curdling of milk by this bacillus is due in almost all cases to the formation of acid, presumably lactic acid, by the bacteria. In a few cases of curdling produced after several days' incubation, the coagulation is ascribed to an enzyme. An enzyme having the power of converting caseinogen into casein can be separated from the bacteria, but in general this plays no part in the initial curdling. W. D. H.

Origin of Fusel Oil. Oskar Emmerling (*Ber.*, 1904, 37, 3535—3538).—Fusel oil is formed from carbohydrates, especially from starch and sucrose, also from pentoses such as arabinose and xylose, and from pentosans, by the action of anaërobic bacteria, which are commonly found on the skins of potatoes. The yield of fusel oil almost disappears if the starch or sucrose is hydrolysed before fermentation. Hydrogen, carbon dioxide, and butyric acid are formed as by-products of the action. G. Y.

Behaviour of Proteids during Alcoholic Fermentation. Leonid Iwanoff (*Zeit. physiol. Chem.*, 1904, 42, 464—492).—The amount of proteids present in yeast before and after fermentation remains practically the same; it is highly improbable that this is due to a state of equilibrium between proteid synthesis and decomposition. The yeast during fermentation does not synthesise proteids from the non-proteid nitrogenous substances present, although it is able to convert added asparagine into proteids.

When yeast is kept for some time without a nutrient medium, some 40 per cent. of the proteid nitrogen is transformed into non-proteid nitrogen, and on the addition of a glucose nutrient medium some 40—60 per cent. only of the non-proteid is synthesised into proteid nitrogen. It should thus be impossible for the proteid decomposition to be completely obscured by proteid synthesis.

Fermented yeast undergoes proteolysis much less readily than unfermented yeast, and the addition of fermented to unfermented retards its autolysis. This retarding substance is a volatile product of fermentation, its activity is not destroyed by filtration through a Chamberland filter, but is largely interfered with by boiling. The substance is not alcohol, but probably an aldehydic by-product. The addition of monopotassium phosphate not merely entirely negatives the retarding influence of this substance, but considerably increases the rate of autolysis.

The decomposition of proteids during fermentation observed by Mitscherlich, Thénard, Pasteur, Liebig, Nageli, Duclaux, Schützenberger, and Detmer was largely due to their not working with sterilised materials, and to the long time allowed for the fermentation to proceed. J. J. S.

Preparation of Yeast Poor in Glycogen and its Use for the Detection of Sugar in Urine. Eduard Buchner and Sigurd Mitscherlich (*Zeit. physiol. Chem.*, 1904, 42, 554—562).—Many "bottom" yeasts contain appreciable amounts of glycogen, and this interferes with many of the reactions in which the yeast is used; for example, a press extract obtained from such a yeast undergoes autofermentation with evolution of carbon dioxide without the addition of any sugar.

A yeast practically free from glycogen may be obtained by exposing the pressed and sifted yeast in thin layers for a day at 2°, or for 8 hours at 20° or for 3—4 hours at 45°. The presence of air is not necessary, as the operation may be performed in a vacuum or in an atmosphere of carbon dioxide with similar results. The activity of the yeast is not destroyed by this treatment, but in some cases appears to be strengthened. The extract obtained from such a yeast is of considerable use in detecting and estimating sugar in urine. J. J. S.

Origin of Carbon Dioxide in Seeds during Germination. Edouard Urbain (*Compt. rend.*, 1904, **139**, 606—608).—According to Connstein, Hoyer, and Wartenberg (compare Abstr., 1903, i, 218) and to Nicloux (compare this vol., ii, 508, 635), the hydrolysis in a sterile medium of the fats in castor oil seeds is dependent on the presence of carbon dioxide. The author finds that the carbon dioxide does not come from the air, for if the seeds are ground with a 1 per cent. solution of chloral hydrate and sealed in a flask which has been freed from air, 52—61 per cent. of the fats are hydrolysed after four days and the flask contains carbon dioxide. Comparative experiments on the hydrolysis of castor oil by the action of cytoplasm only, or of cytoplasm and aleurone in a sterile medium deprived of air, show that the origin of the carbon dioxide is due to the hydrolysis of proteid material by the proteolytic enzyme, as in the first case only 0·07 per cent. of the fats were hydrolysed, whilst in the last 96 per cent. were hydrolysed and carbon dioxide was formed. M. A. W.

Influence of Decomposition Products of Proteid Matter on the Saponification of Oils by Cytoplasm. Edouard Urbain, L. Perruchon, and J. Lancon (*Compt. rend.*, 1904, **139**, 641—643).—In a previous paper (preceding abstract) it has been shown that the formation of carbon dioxide during the germination of seeds is due to the decomposition of proteid matter, and the results of further experiments show that the total quantity of nitrogenous matter not precipitated by Weiss's method (compare Abstr., 1901, ii, 69) increases with the quantity of fatty substance saponified. In addition to carbon dioxide, the chief decomposition products of proteid matter in the process of the saponification of castor oil seeds are leucine and asparagine, and these substances in the presence of carbon dioxide or acetic acid exert an accelerating action on the saponification of the oil by cytoplasm (compare Effront and Schidrowitz, Abstr., 1903, ii, 680).

M. A. W.

The Assimilation of Carbon Dioxide. Walther Löb (*Ber.*, 1904, **37**, 3593—3596. Compare Euler, this vol., ii, 761).—Formaldehyde, which plays so important a part in the carbon assimilation of plants, has not been obtained as a product of the reduction of carbon dioxide by either chemical or electrolytic means. A repetition of the experiments of Berthelot (Abstr., 1901, ii, 2) and of Losanitsch and Jovitschitsch (Abstr., 1897, i, 179) showed that in the action of the silent electric discharge on dry carbon dioxide, carbon monoxide and ozone are produced, moist carbon dioxide yielding formic acid and hydrogen peroxide. The process of carbon dioxide assimilation is endothermic, and the presence of a catalytic agent is probably essential in any attempt to imitate the natural process. C. H. D.

Decomposition of Carbon Dioxide by Light. Alexis Bach (*Ber.*, 1904, **37**, 3985—3986).—A reply to Euler (this vol., ii, 761). A. McK.

Metabolism of Germinating Plants. Ernst Schulze and Nicola Castoro (*Zeit. physiol. Chem.*, 1904, **43**, 170—198).—Experiments made on germinating lupins by the autolytic method confirm the previous conclusion that asparagine is a secondary product of proteid katabolism; the formation of arginine, a primary product, goes *pari passu* with proteid breakdown. W. D. H.

Action of some Salts and Monohydric Alcohols on the Development of Moulds. K. S. Iwanoff (*Centr. Bakt. Par.*, 1904, ii, **13**, 139—144).—The toxicity of the metals of the uneven series of Mendeléeff's second group (Mg, Zn, Cd, Hg) increases with the atomic weight. This accords with the observations of others and with the results obtained with the alkali metals. Of other metals, manganese is the least toxic, then cobalt, nickel, and copper. The toxicity varies, however, to some extent according to the nitrogenous matter employed, and also according to the substance utilised as source of carbon.

The toxicity of primary monatomic alcohols increases with the length of the chain. Of the different butyl alcohols, *n*-butyl alcohol is the most poisonous. *n*-Propyl alcohol is more poisonous than *iso*propyl alcohol. Alcohols with double linkings are more poisonous than those with single linkings, as, for example, allyl alcohol and *n*-butyl alcohol.

Results obtained with copper accorded with Loeb's theory that the poisonous action consists in the combination of the metal with portions of the plasma. N. H. J. M.

Some Complex Carbohydrates. V. Zanotti (*Bied. Centr.*, 1904, **33**, 660—663; from *Ricerch. Scuol. sup. Milan*, 1898—1902, **2**, 15).—A substance was obtained from nut shells by treating with sodium hydroxide and precipitating with acetic acid and alcohol, which, when hydrolysed, yielded dextrose and xylose in constant proportions to each other. *Penicillium glaucum* yielded a substance from which mannose was obtained by hydrolysis.

The results of experiments in which purified cotton-wool was oxidised with potassium chlorate and hydrochloric acid, with chromic oxide and sulphuric acid, and with potassium permanganate and sulphuric acid were inconclusive; they indicate, however, that the cellulose is converted into substances containing less carbon or more oxygen. N. H. J. M.

Occurrence of Tyrosine in Elderberries (Sambucus nigra). J. Sack and Bernhard Tollens (*Ber.*, 1904, **37**, 4115).—The expressed juice of the elderberries, after precipitation of impurities with lead acetate and hydrogen sulphide, yields on evaporation crystals of tyrosine. E. F. A.

Successive Conditions of Vegetable Matter. Eugène Charabot and Alexandre Hébert (*Compt. rend.*, 1904, **139**, 608—609).—The results of experiments with *Ocymum basilicum*, *Citrus madurensis*, and *C. bigaradia* showed that the differences in solubility of the substances of the leaf and stem are similar to those in the essences (Charabot and Laloue, this vol., ii, 581). Roots and stems are formed of substances less soluble than those of the leaves. The diminished solubility of the substances of the stems is attributed partly to the production of woody matter and partly to the migration of soluble matters to new organs. In the case of the leaves, a continuous production of soluble matter compensates for the loss due to migration.

N. H. J. M.

Action of Various Insoluble Phosphates on Rice Plants. Muneshige Nagaoka (*Bul. Coll. Agr. Tōkyō*, 1904, **6**, 215—261).—Rice was grown in wooden frames (0·8 sq. m.) and manured with ferric, ferrous, aluminium, and calcium phosphates respectively at the rate of 25, 50, and 100 kilos. of phosphoric acid per hectare, in addition to potassium and nitrogenous manures. The experiments extended over four years, but without further application of phosphates after the first year. The effect of the different phosphates over the whole period, compared with that of double superphosphate = 100, was as follows:

	1st year.	2nd year.	3rd year.	4th year.
Double superphosphate......	100	100	100	100
Ferric phosphate	140	141	399	58
Ferrous „	87	88	194	44
Aluminium „	92	145	514	112
Calcium „	117	110	161	118

The high results obtained the first year are attributed to the action of the large amount of humic acid in the soil on the phosphates.

Application of lime diminished the assimilability of the phosphates. Calcium carbonate, in conjunction with the largest amount of phosphates, had very little effect except in the case of ferric phosphate. The effect of calcium carbonate was, however, more lasting than that of lime. N. H. J. M.

Behaviour of the Rice Plant to Nitrates and Ammonium Salts. Muneshige Nagaoka (*Bul. Coll. Agr. Tōkyō,* 1904, **6**, 285—334. Compare Pagnoul, Abstr., 1897, ii, 120; Klöpfer, 1900, ii, 616).—It is shown that paddy plants utilise nitrogen in the form of ammonium salts to a greater extent than nitrates, and this is attributed to the absence in the leaves of sufficient sugar for the conversion into proteids of all the nitrogen absorbed. It may also be due in part to denitrification and to formation of nitrites in the soil. Nitrous acid was detected in two cases.

The value of nitric nitrogen, as compared with ammoniacal nitrogen

= 100, was with paddy rice 40, with *Juncus* 37, and with arrowhead 33.

Results obtained with different nitrates (sodium, potassium, calcium, barium, strontium, and magnesium nitrates) showed that almost exactly the same amount of nitrogen was assimilated in each case (compare Schneidewind, *Jahresb. Agric. Chem.*, 1897, **20**, 228). Differences in the relations of grain and straw were observed, but these are attributed to other conditions. N. H. J. M.

Molasses Food from Seed-Beet Straw. W. Rosam (*Bied. Centr.*, 1904, **33**, 703—704; from *Oesterr.-ung. Zeit. Zuckerind. u. Landw.*, 1904, **32**, 974).—The food is prepared by mixing equal weights of heated molasses and ground straw. It keeps well and is appreciated by cattle. In some cases, however, when the amount consumed was large (over 2 kilos.), eruptions were produced on the feet which healed slowly. The composition of the food was as follows: water, 19·86; proteids, 0·92; amino-acids, 5·64; fat, 0·28; sucrose, 25·20; non-nitrogenous extract, 19·87; crude fibre, 19·44; pure ash, 8·70; and sand, 0 09 per cent. N. H. J. M.

Effects of Soil Ignition on the Availability of Phosphoric Acid for Rice Culture in Paddy Fields. Muneshige Nagaoka (*Bul. Coll. Agr. Tōkyō*, 1904, **6**, 263—276).—The phosphoric acid soluble in hydrochloric acid of sp. gr. 1·15, ammonium citrate, acetic acid (5 per cent.), citric acid (1 per cent.), oxalic acid (1 per cent.), and carbonic acid (saturated) was determined in a soil before and after ignition. The ignited soil gave, in every case, more phosphoric acid than the original soil, owing to the liberation of phosphoric acid originally present in humus, nuclein, and lecithin (compare Nilson and Eggertz, Abstr., 1890, 192; Schmoeger, *Landw. Jahrb.*, 1896, **25**, and 1897, **26**; Nannes, Abstr., 1899, ii, 798, and Schreiber, *ibid.*, 1896, ii, 66).

The results of pot experiments with rice (manured with nitrogen and potassium) showed that the burnt soil gave very poor yields as compared with the unburnt soil, owing, probably, to deficiency of humus and to unfavourable mechanical conditions. A mixture of unburnt and burnt soil (3 : 1) gave, however, a much greater yield than unburnt soil alone.

Applications of lime, calcium carbonate, and potassium carbonate diminished the yield of rice, and still more the consumption of phosphoric acid; in most cases, the unfavourable action of the alkali continued the second year. It is desirable to add to burnt soil a certain amount of humus or organic matter which will yield humus. N. H. J. M.

Organic Compounds of Phosphorus in the Soil. Keijirō Asō (*Bul. Coll. Agr. Tōkyō*, 1904, **6**, 277—284. Compare preceding abstract).—The chief organic phosphorus compound in soils is nuclein; a very small amount of lecithin was found. The organic phosphorus is rendered available by burning the soil. Steam, under pressure, increased the solubility (in cold hydrochloric acid) of both phosphoric acid and sulphur. N. H. J. M.

Influence of Liming on the Activity of the Phosphoric Acid of Manures. BERNHARD SCHULZE (*Bied. Centr.*, 1904, **33**, 653—654; from *Fühling's Landw. Zeit.*, 1904, **53**, 186, 216 and 261).—The phosphoric acid of bone-meal, when applied to soil poor in lime, is very nearly equal to citric-acid-soluble phosphoric acid. Liming has very little effect on water-soluble phosphoric acid, more on phosphoric acid soluble in citric acid, and most on bone-meal, when the phosphatic manure is put on in the spring. The greatest injury occurs when burnt lime is applied in the spring, and the least when calcium carbonate is applied in the autumn. In the case of sparingly soluble phosphates, the maintenance of a supply of humic acids is of importance.

N. H. J. M.

Influence of Liming on the Action of Phosphatic Manures. MUNESHIGE NAGAOKA (*Bul. Coll. Agr. Tōkyō*, 1904, **6**, 195—214. Compare Kellner and Böttcher, Abstr., 1901, ii, 275; 1902, ii, 351 and 528, and Söderbaum, this vol., ii, 78).—The experiments were made with rice grown in 57 wooden frames having an area of 0·8 sq. m. Various organic phosphatic manures (animal and vegetable) were applied, both without and with pure lime (at the rate of 400 kilos. per hectare).

The results showed that addition of lime greatly reduced the availability of the phosphoric acid, and that its action in conjunction with animal manures (fish, fish-bone, and steamed bone-meal) was twice as great as in the case of vegetable manures (rice, bran, rape, and other cakes). The effect of lime extends over the second year.

Animal phosphates were found to be much more active than vegetable phosphates; in the second year, the difference was less. The soil was a fine sandy loam containing 10—11 per cent. of humus and 0·9 per cent. of lime soluble in hot concentrated hydrochloric acid.

N. H. J. M.

Agricultural Employment of Calcium Cyanamide. MAX GERLACH (*Bied. Centr.*, 1904, **33**, 649—651; from *Mitt. deut. Landw.-ges.*, 1904, St. 8. Compare Tacke, this vol., ii, 768).—Crude calcium cyanamide, prepared by heating powdered calcium carbide in air from which the oxygen has been removed, forms a black powder, resembling basic slag in appearance. It contains above 20 per cent. of nitrogen, readily soluble in water, calcium oxide and carbide, and carbon.

The results of pot experiments with barley and white mustard indicated that the manure is equal to sodium nitrate or ammonium salts. In field experiments extending over two years, the value of the manure proved to be much lower, 74 as compared with sodium nitrate = 100. In the case of some soils, especially peaty soils, the manure acts injuriously. This is probably due to the production of dicyanodiamide by the action of acids. Wagner showed that great loss of nitrogen, in the form of ammonia, may readily occur.

The nitrogen of calcium cyanamide can without difficulty be converted into ammonium sulphate. N. H. J. M.

Analytical Chemistry.

Filter Stand. G. Iliovici (*Zeit. anal. Chem.*, 1904, **43**, 508—509).—A light brass filter stand, capable of supporting six funnels, which, without the use of screws, can be fixed at any convenient height, and can also be moved sideways. The whole packs closely when taken to pieces. M. J. S.

The Use of Potassium Hydrogen Iodate for Standardising Volumetric Solutions. Charles E. Caspari (*Pharm. Rev.*, 1904, **22**, 371—376).—This salt may be prepared by mixing a solution of potassium hydrogen carbonate with an equivalent amount of iodic acid, and if the mixture then be neutral, a second quantity of iodic acid, equal to the first, is also added. The solution is evaporated until crystallisation begins and the first crop of crystals is rejected. The crystals which separate after the solution has cooled to 50° are almost pure and will be quite pure if recrystallised once from water. Potassium hydrogen iodate reacts with potassium iodide in acid solution according to the equation: $KH(IO_3)_2 + 10KI + 11HCl = 11KCl + 6H_2O + 6I_2$. One molecule of potassium hydrogen iodate is therefore equivalent to 12 molecules of sodium thiosulphate. The salt is readily reduced by a slight excess of sulphurous acid. After expelling the excess by heating, the solution, now containing hydriodic acid, may be used for standardising silver nitrate solutions. One molecule of potassium hydrogen iodate is equivalent to two molecules of silver nitrate. Finally, potassium hydrogen iodate may be employed to determine the strength of alkali solutions, using phenolphthalein as indicator, one molecule corresponding with one molecule of potassium hydroxide.

Potassium hydrogen iodate keeps well in solution. The salt contains no water of crystallisation, is neither deliquescent nor efflorescent, and can be dried at a temperature of 110° without decomposition taking place. W. P. S.

Detection of Fluorides in Meat Products. J. Froidevaux (*Ann. Chim. anal.*, 1904, **9**, 383).—Thirty grams of the comminuted sample are moistened with 2 c.c. of a saturated solution of sodium carbonate and heated until the organic matter is completely destroyed. The charred mass is then powdered and boiled with water. The filtrate is concentrated and strongly acidified with hydrochloric acid, a few drops of heliantin are added, and then solution of ammonium acetate until the liquid turns yellow. To the liquid, which now contains free acetic acid, is added solution of calcium chloride which, in the presence of an alkali fluoride, will cause a more or less heavy precipitate of calcium fluoride.

The precipitate is then collected and submitted to the usual test with silica and sulphuric acid in Sanglé-Ferrière's apparatus.

L. de K.

Estimation of Fluorine in Wine and Beer. FREDERICK P. TREADWELL and ARTHUR A. KOCH (*Zeit. anal. Chem.*, 1904, 43, 469—506).—The use of sodium fluoride (under the trade name "Remarcol") as a preservative for sweet wines and beer having apparently been followed by toxic symptoms, a commission of chemists has undertaken the investigation of the available methods for the estimation of fluorine in those beverages. Preliminary experiments showed that the solubility of ignited calcium fluoride in water amounted to 0·0016 gram, and in $3/2N$ acetic acid to 0·0111 gram per 100 c.c. Although slightly volatile at the temperature of the blowpipe, it is practically non-volatile at that of the Bunsen burner. In the examination of wine, in cases where the fluorine present is sufficient to yield 5 mg. of calcium fluoride per 100 c.c., Brand's method (Abstr., 1896, ii, 447) can therefore be employed quantitatively. Quantities down to 1 mg. per 100 c.c. can be detected by that method, but the quantitative errors are large with such small amounts. The results are not affected by the presence of sulphates or of sugar. Phosphates and tartrates must, however, first be separated. The modified method adopted is as follows: 100 c.c. of the wine are made feebly alkaline with sodium hydroxide (not with carbonate, for the escaping carbon dioxide carries off hydrogen fluoride); silver nitrate is then added as long as it produces a precipitate, the mixture is made up to 250 c.c. and filtered; 200 c.c. of the filtrate are treated with an excess of sodium chloride, made up to 250 c.c., shaken, and left at rest for 24 hours; 175 c.c. of the clear solution are treated with 3—4 c.c. of $2N$ sodium carbonate solution, precipitated with a large excess of calcium chloride, and boiled for 5 minutes. The precipitate is collected on a filter, washed thoroughly with hot water, ignited at a dull red heat for 10—20 minutes, then digested with 2—4 c.c. of $3/2N$ acetic acid, washed free from calcium acetate, ignited, and weighed. The treatment with acid, &c., is repeated until a diminution of less than 0·5 mg. takes place. For each 100 c.c. of filtrate and washings, 0·0016 gram is added to correct for solubility. Ten specimens of genuine wine did not contain enough fluorine to allow of its detection in 100 c.c. Fluorides are therefore not normal constituents of wine. One sample of guaranteed purity showed 5·4 grams of sodium fluoride per hectolitre.

The above method is unsuitable for beer. A modification of Penfield's method (Abstr., 1879, 829) gave results which were fairly concordant, but about 6 per cent. too low. This loss was traced to the incineration which was necessary to free the calcium fluoride from organic matter. The best results were obtained with a special form of reaction vessel in which the contact of the calcium fluoride with the sulphuric acid was promoted by the current of air. The beer must be made alkaline with sodium hydroxide, since otherwise the precipitate will contain calcium hydrogen phosphate, which during the ignition will decompose part of the calcium fluoride. In nine samples of beer examined, no fluorine could be detected. M. J. S.

New Method for the Estimation of Sulphur in Irons and Steels. H. B. PULSIFER (*Chem. News,* 1904, 90, 230—231).—2·5 grams of the sample, preferably in the form of drillings, are moistened in a beaker with a little water and then treated with 20 c.c. of chloric acid of sp. gr. 1·12, a very small quantity of hydrofluoric acid being also added. When the action has subsided, 5 c.c. of concentrated hydrochloric acid are added and the mixture boiled to dissolve any particles on the sides of the beaker. The solution is now poured on a filter and the latter washed once or twice with water. To the filtrate, 20 c.c. of concentrated hydrochloric acid are added and the whole evaporated to a volume of about 10 c.c. The filter and residue are meanwhile placed in a nickel crucible, covered with sodium peroxide, and heated over a strong flame. The cover of the crucible should be held down by the tongs. In a few seconds, the fusion is completed. After cooling, the fused mass is cautiously dissolved in water, the solution acidified with hydrochloric acid, filtered, and the filtrate added to the main portion already obtained. The united filtrates should have a volume of about 100 c.c., and are precipitated with barium chloride as usual. W. P. S.

Applicability of Phosphorous Acid for the Estimation of Selenium and Tellurium. Alexander Gutbier (*Zeit. anorg. Chem.*, 1904, **41**, 448—451).—Compounds of hexavalent selenium or tellurium, such as selenic and telluric acids, cannot be completely reduced by phosphorous acid. Selenious and tellurous acids are very readily reduced to the corresponding elements when their concentrated solutions in hydrochloric acid are boiled with phosphorous acid. The method is quantitative. A. McK.

Estimation of Nitrogen. Eduard Jalowetz (*Chem. Centr.*, 1904, ii, 1068; from *Allgem. Zeit. Bierbrau. u. Malzfabr.*, 1904).—The author calls attention to the considerable amount of alkalis which may be dissolved from the glass condenser during an ammonia estimation by Kjeldahl's method, and find their way into the distillate, thus vitiating the result. L. de K.

Influence of the Quality of the Glass on the Accuracy of the Nitrogen Estimations by Kjeldahl's Method. K. Barelt and H. Schönewald (*Chem. Centr.*, 1901, ii, 1068; from *Woch. fur Brauerei*, 21, 523).—The authors confirm Jalowetz's statement as to the solubility of alkalis from the glass (see preceding abstract). It is recommended to steam the apparatus well before use, and not to continue the distillation longer than is strictly necessary.
L. de K.

Gravimetric Estimation of Boric Acid by Extraction with Ether. Alfred Partheil and J. A. Rose (*Arch. Pharm.*, 1904, **242**, 477—488. Compare Abstr., 1902, ii, 48).—Boric acid cannot be weighed as metaboric acid, for when it is dried at 105° a little boric acid volatilises with the water. When a solution of boric acid in anhydrous ether is evaporated, no acid volatilises, as is the case when the ether contains even a little water. At 25°, 100 grams of anhydrous ether dissolve 0·00775 gram, 100 grams of ether saturated with water 0·2391 gram, of boric acid, H_3BO_3. The distribution ratio of boric acid in ether saturated with water : water saturated with ether is 1 : 45·4 at 26°, 1 : 44·6 at 17°.

Boric acid in milk was estimated by evaporating 50 c.c. with 1 gram of anhydrous sodium carbonate, igniting the residue, extracting the ash with water, making the extract faintly acid with hydrochloric acid, precipitating the phosphoric acid with a few drops of ferric chloride solution, removing the excess of iron with alkali hydroxide, filtering, concentrating the filtrate to 10—15 c.c., acidifying with hydrochloric acid, extracting with ether, &c.; the error in 3 estimations lay between 0 and + 10 per cent.

Boric acid in minced meat was estimated by adding 1 gram of anhydrous sodium carbonate to 20 grams of the meat, drying, igniting the residue cautiously, and treating the ash as in the preceding case; the error in 3 estimations was – 0 to + 0·5 per cent.; in a commercial sample, 0·378 per cent. of boric acid was found.

Borax in margarine was estimated by melting 50 grams of the sample 4 times in succession with 20 c.c. of water, the water being poured off each time after the fat had solidified. The water was then made alkaline and evaporated to dryness, the residue ignited, the ash extracted with water, the extract acidified with hydrochloric acid, extracted with ether, &c. In a commercial sample, 0·154 per cent. of borax was found. C. F. B.

The Preparation of Alcoholic Solutions of Potassium Hydroxide which will remain Colourless. HERMANN THIELE and ROBERT MARC (*Zeit. öffentl. Chem.*, 1904, 10, 386—387).—To prepare 1 litre of *N*/2 solution, 43·5 grams of potassium sulphate are mixed with 110—120 grams of barium hydroxide in a platinum or china basin and 100 c.c. of water are poured over the mixture. The basin and its contents are weighed, heated for 15 minutes with constant stirring, cooled, and again weighed. Water is then added until the original weight is obtained. The contents of the basin are now rinsed into a flask with 800 c.c. of alcohol and a further 100 c.c. of water. After shaking and allowing the precipitate to settle, 3 or 4 c.c. of concentrated potassium sulphate solution are added to remove any barium hydroxide dissolved by the 80 per cent. alcohol. When the precipitate has again settled, the clear supernatant solution may be drawn off. The latter will be of approximately the desired strength and will keep for months without turning brown. W. P. S.

Estimation of Silver in Commercial Zinc. K. FRIEDRICH (*Zeit. angew. Chem.*, 1904, 17, 1636—1644).—200—1000 grams of the granulated sample are treated with hydrochloric acid, and when practically all dissolved, the residue is collected, washed, and melted with 7·5—15 grams of assay lead with addition of some borax. The regulus is then cupelled in the usual way and the button of silver examined as usual for traces of gold.

A table is given showing the percentage of silver in 31 samples of commercial crude and refined zincs. L. DE K.

Strontium Chromate and the Microchemical Detection of Strontium. WILHELM AUTENRIETH (*Ber.*, 1904, **37**, 3882—3887).—Strontium is most readily detected microchemically by the formation of the chromate, which forms bundles of long, slender, highly refracting needles, or, on separating from very dilute solutions, thick prisms of hexagonal habit. The latter form appears to be labile, and is slowly transformed into the former. Under the same conditions, barium chromate separates in an amorphous form or in indefinite crystals, and calcium chromate remains in solution. Strontium chromate dissolves readily in acetic acid. When calcium, strontium, and barium are present together, they are best detected by separating the anhydrous chlorides by means of absolute alcohol, and subsequently applying the microchemical test. C. H. D.

Estimation of Metallic Aluminium in Aluminium Powder. E. KOHN-ABREST (*Ann. Chim. anal.*, 1904, **9**, 381—382).—0·5 gram of the powder is heated with 20 grams of ferric sulphate and 50 c.c. of water in a current of carbon dioxide until dissolved. When cold, the liquid is mixed with 20 c.c. of sulphuric acid, diluted to 250 c.c. with water, and the ferrous iron formed is then at once titrated with permanganate. One part of iron equals 0·1607 part of aluminium.

Should the powder contain iron, this must be estimated and allowed for, as it also causes reduction. L. DE K.

Standardisation of Potassium Permanganate. H. CANTONI and M. BASADONNA (*Ann. Chim. anal.*, 1904, **9**, 365—371).—The authors come to the conclusion that the iodometric process should be used in laboratories where no facilities exist for the preparation of electrolytically-deposited metallic iron (compare Dupré, this vol., ii, 591). L. DE K.

Volumetric Estimation of Chromium and Iron simultaneously present. B. GLASMANN (*Zeit. anal. Chem.*, 1904, **43**, 506—508).—Ferric iron is reduced by sulphurous acid, which has no action on chromic salts, and is titrated in the usual way with permanganate. The same portion of solution, which should not contain more than 0·05 gram of Cr_2O_3, is then treated with zinc and sulphuric acid, by which the chromic oxide is reduced to chromous oxide. A second titration with the permanganate reoxidises both ferrous and chromous oxides to ferric and chromic, and the latter is calculated from the difference between the two titrations. M. J. S.

Colour Reaction for Tungsten. C. FRABOT (*Ann. Chim. anal.*, 1904, **9**, 371—372).—The tungstic acid, which may contain an admixture of silica but must be free from molybdic acid, is mixed with a few crystals of uric acid and then with a few drops of aqueous sodium hydroxide, when a fine blue colour will be developed.

L. DE K.

A New Reaction for Bismuth. C. REICHARD (*Chem. Zeit.*, 1904, **28**, 1024—1026).—A concentrated solution of bismuth chloride gives a dark red coloration with an excess of brucine. The colour is not destroyed on adding a drop of hydrochloric acid and evaporating to dryness. This reaction is characteristic for bismuth, but antimony also gives a similar reaction on applying heat. L. de K.

New Reaction of Formic Acid. Ezio Comanducci (*Rend. Accad. Sci. Fis. Mat. Napoli*, 1904, [iii], 10, 202—203).—With a cold concentrated aqueous sodium hydrogen sulphite solution, formic acid, even in aqueous solutions of 0·5 to 1 per cent. strength, gives a pale yellow coloration, which becomes orange-yellow on boiling the liquid for a few seconds, and disappears on further heating.

This test may be employed to detect from 1 to 1·5 per cent. of the acid in formalin, methyl alcohol, glycerol, or acetic acid. It is best carried out by diluting about 2·5 c.c. of the liquid to be tested with an equal volume of water, adding 15 drops of concentrated sodium hydrogen sulphite solution (5 grams to 5 c.c. of distilled water), agitating, and heating gently. T. H. P.

Indirect Estimation of Fat in Milk. L. Pierre (*Ann. Chim. anal.*, 1904, 9, 390).—A further reply to Steinmann (this vol., ii, 789). L. de K.

The Acidity of Milk. R. Hanne (*Milch Zeit.*, 1904, 33, 659—660).—The author recommends the following modification of Soxhlet's method for the estimation of the acidity of fresh milk. To 50 c.c. of the milk are added 2 c.c. of a 2 per cent. alcoholic phenolphthalein solution, and the mixture is titrated with $N/10$ sodium hydroxide solution. The end-point of the titration is taken when a permanent red coloration is obtained. The number of c.c. of $N/10$ sodium hydroxide required to neutralise the 50 c.c. of milk is termed the acid value of the milk. One "degree" of acidity as estimated by Soxhlet's method therefore corresponds with 1·25 "degrees" by the above method. Water should not be added to the milk before titration, and the author sees no advantage in calculating the acidity on 100 c.c. of milk. The addition of 3 drops of formalin to the 50 c.c. of milk caused an increase in the acidity, which was not due to the acidity of the formalin. W. P. S.

Reactions for the Microchemical Detection of Organic Bases. Theodore H. Behrens (*Zeit. anal. Chem.*, 1904, 43, 333—355. Compare Abstr., 1903, ii, 455).—A solution of iodine in potassium iodide serves to distinguish between fatty and aromatic bases, yielding crystalline derivatives with the latter only. Aromatic bases do not form double magnesium phosphates, it is therefore possible to separate them from ammonia and most of the alkylamines by the addition of magnesium hydroxide and sodium phosphate. Heterocyclic bases may be detected in the presence of homocyclic bases by oxidising the latter with chromic acid.

A method for the separation of primary, secondary, and tertiary aromatic bases by means of benzenesulphonic chloride is described.

Tertiary bases also yield sparingly soluble compounds with potassium ferrocyanide and hydrochloric acid.

Homocyclic diamines are separated from monoamines by their non-volatility in a current of steam, or, in many cases, by the formation of sparingly soluble sulphates.

Aminophenols, imines, and amino-acids are separated by ammonium carbonate, which sets free the two former, the amino-acids remaining as ammonium salts. Imines are separated from aminophenols by precipitation with sodium acetate; aminophenols and hydroxyquinolines yield brightly coloured compounds with diazobenzenesulphonic acid.

The orientation of bases in the aniline, aminophenol, and naphthylamine groups may be determined, and a partial separation of the isomerides effected by adding a cold saturated solution of potassium antimony tartrate to a neutral solution of the hydrochlorides. The characters of the ortho-, meta-, and para-derivatives are described.

Homocyclic Amines.—The aqueous solution is very slowly distilled with sodium hydroxide. The first drops of the distillate contain only aniline, followed by the toluidines. These are precipitated as iodosulphates by adding iodine and sodium sulphate to the acidified solution. The xylidines separate as hydriodides. The higher homologues and α-naphthylamine separate in the solid form, β-naphthylamine mostly remains in the distilling flask. Phenylenediamines are extracted from the residue by adding potassium carbonate and shaking with *iso*butyl alcohol. *o*-Phenylenediamine is precipitated by alloxan and sodium acetate as quinoxaline; the *p*-diamine is precipitated from the filtrate as sulphate; the *m*-diamine is recognised by its colour-reactions on diazotising or by its iodo-derivative.

Formyl and acetyl derivatives of bases yield characteristic platini-iodides.

Benzylamines.—The free bases are shaken with water and a small quantity of benzene, which extracts di- and tri-benzylamine (1). Sodium hydroxide is added to the residual solution, and the monobenzylamine extracted with benzene and precipitated with α-naphthaquinone. The benzene solution (1) is evaporated, converted into sulphates, and shaken with benzene after addition of sodium carbonate. A crystalline residue on evaporating the benzene indicates tribenzylamine.

Heterocyclic Bases.—Pyridine and its homologues are separated from a solution in which litmus remains violet by distillation. Pyridine is precipitated as tri-iodopyridine, the homologues are separated by oxidation with potassium permanganate. Pyrrole and indole may be distilled even in presence of free sulphuric acid. Quinoline derivatives are characterised by their ferrocyanides. Hydroxyquinolines are not volatile in a current of steam. Aminoquinolines react both as quinoline derivatives and as primary amines. Acridines are separated from quinoline by precipitation as acridine sulphite, and may also be recognised by their crystalline mercurichlorides.

Alkaloids.—Most of the alkaloids may be characterised by their ferrocyanides. Coniine, nicotine, and sparteine distil in a current of steam. Pilocarpine, cytisine, cocaine, ecgonine, and the atropine group dissolve readily in water and may be sublimed. To separate them, sodium carbonate is added to the solution, from which light petroleum extracts cocaine; benzene then extracts pilocarpine, tropine, atropine bases, and codeine; chloroform extracts cytisine; ecgonine is extracted last by *iso*butyl alcohol. Morphine, apomorphine, and cupreine are sparingly soluble in water, dissolve in sodium hydroxide, and are precipitated by ammonium carbonate. Narceine, narcotine, papaverine, and thebaine are precipitated by sodium carbonate, and do not dissolve in sodium hydroxide. Strychnine cannot be separated perfectly from brucine, the best results are given by precipitation with platinic chloride. Veratrine (cevadine) yields no characteristic precipitates. The cinchona bases may be fractionally sublimed, the first fraction containing cinchonine and cinchonidine, which are then separated by crystallisation from water. The second fraction, containing quinine and quinidine, is separated with difficulty. Different methods are described according to the relative proportions of the various cinchona bases present.

The microscopic characters of the various precipitates are described.

C. H. D.

Alkaloid Reactions. III. Atropine. C. Reichard (*Chem. Zeit.*, 1904, **28**, 1048—1050).—The following new tests for atropine are given. If atropine sulphate is rubbed with a little sucrose and moistened with a drop of hydrochloric acid, the mass turns rose-red or dark red on warming and remains so for some time. If atropine is mixed with arsenious or arsenic acid and sulphuric acid, a reduction of arsenic takes place. If a small particle of cobalt nitrate is dissolved in a drop of water and mixed with a trace of atropine sulphate, no reaction takes place in the cold, but, on warming and evaporating, a green residue is obtained, which dissolves in water with a green colour; at the same time, the characteristic atropine odour is noticed. This colour is destroyed by ammonia, potassium hydroxide turns it violet. A solution of bismuth trichloride gives no reaction with atropine, but, on adding sulphuric acid, an intense yolk-of-egg colour is obtained. A solution of antimony trichloride gives a green colour on warming. Other reactions of less importance are also communicated.

L. de K.

Certain Reactions of the Cinchona Alkaloids. Albert B. Lyons (*Pharm. Rev.*, 1904, **22**, 365—371).—A slightly acid solution containing about 2 per cent. of quinine sulphate gives precipitates when mixed with a 10 per cent. solution of either ammonium acetate, ammonium citrate, potassium sodium tartrate, ammonium oxalate, or sodium salicylate. A similar solution of cinchonidine sulphate is also precipitated by these reagents with the exception of ammonium oxalate. Sodium salicylate alone precipitates quinidine and cinchonine from their acid solutions. Borax gives no precipitate with any of these alkaloids if the solutions be distinctly acid in reaction, whilst sodium benzoate precipitates all four; the addition of a little water, however, redissolves the crystals. Sodium phosphate precipitates quinine, cinchonidine, and cinchonine, but not quinidine. Potassium iodide and chromate do not precipitate these alkaloids in acid solutions. In neutral solutions, precipitates are obtained in the case of quinine. Acid solutions of quinine are not affected by resorcinol, but strong neutral solutions of quinine bisulphate deposit crystals when mixed with the latter reagent. In all cases where precipitation occurs, the addition of more sulphuric acid or a little alcohol redissolves the precipitate. W. P. S.

Tests for Strychnine and Brucine. [II. Strychnine.] C. Reichard (*Chem. Zeit.*, 1904, 28, 977—979).—A critical review of tests already known. The following new reactions are given. A mixture of strychnine nitrate and copper nitrate yields a residue which turns violet on addition of stannous chloride, but, on drying, the mass again becomes green. On evaporating strychnine nitrate with platinic chloride and then adding sulphuric acid, the mixture turns dark red on warming; brucine turns yellow. Hydrogen peroxide, strychnine, and sulphuric acid give a blue liquid with yellow edges; after a while, the mixture turns yellow; the colouring matter is not extracted by ether. Sulphuric acid, strychnine, and titanic acid give a blue liquid gradually changing to yellow, which remains so on adding water (distinction from brucine). Strychnine, when evaporated with potassium hydroxide, gives a residue which turns dark blue on adding stannous chloride; brucine gives no colour. Hydrochloric acid and potassium persulphate give no reaction with strychnine in the cold, whilst with brucine a splendid red colour is developed which disappears only after some time. On warming, the strychnine solution turns yellow. This persulphate test will show the smallest admixture of brucine in a strychnine solution. L. de K.

The Neutral-red Reaction for Bacillus Coli Communis. Ernest W. Moore and Cecil Revis (*J. Pathol. Bacteriol.*, 1904, 10, 97—104).—Unsatisfactory results were obtained in the use of this reaction; this is due to the kind of medium used; the addition of glucose is inhibitory rather than the reverse. The presence of lactose appears to be essential. W. D. H.

Reactions of the Oxidising Enzymes of Cow's and Human Milk. Franz Utz (*Chem. Centr.*, 1904, ii, 1000; from *Oesterr. Chem. Zeit.*, 1904, 7, 389—391).—An adverse criticism of Rullmann's work (this vol., ii, 304). L. de K.

Detection of Yeast Extract in Meat Extract. M. Wintgen (*Arch. Pharm.*, 1904, 242, 537—538).—A 10 per cent. solution of the extract is made, and 20 c.c. of it are mixed with 2 c.c. of sulphuric acid (1 : 4) and salted out with powdered zinc sulphate. After remaining for 1—2 days, the liquid is filtered through a good filter, the first few c.c. that come through being poured back on to the filter; if not less than 20—30 per cent. of the extract was yeast extract, the filtrate is milky. This turbidity must be looked for at once, for it disappears gradually when the filtrate is allowed to remain. Milk extracts, like meat extracts, give a perfectly clear filtrate in the same circumstances. C. F. B.

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Hæmatein.
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(o-*Xylene, Me* : *Me*=1 : 2 ; m-*xylene, Me* : *Me*=1 : 3 ; p-*xylene, Me* : *Me*=1 : 4.)

- *as*-m-**Xylidine** hydrobromide *per*bromide, bromo- (Fries), A., i, 571.
- *m*-**Xylidinesulphonic acid**, diazotised, action of bleaching powder on (Maué), A., i, 458.
- *m*-**Xylidinoacetonitrile** (Knoevenagel and Klucke), A., i, 989.
- **Xyloquinone**, *di*hydroxy- (Fichter and Willmann), A., i, 678.
- **Xylosephenylmethylhydrazone** and its melting point (Müther and Tollens), A., i, 224.
- **4-*m*-Xylylaminobenzoic acid**, 2-amino- and 2-nitro- (Delétra and Ullmann), A., i, 271.
- **3:4-*m*-Xylylaziminobenzoic acid** (Delétra and Ullmann), A., i, 271.
- *m*-**Xylylene-dianiline** and -*o*- and -*p*-**ditoluidines**, *tri*bromo-*p*-hydroxy-, acetyl derivatives of (Auwers and Bondy), A., i, 1052.
- **Xylylenedianilines**, *o*- and *m*-, *tri*bromohydroxy-, *O*- and *N*-monoacetyl derivatives of (Auwers, Anselmino, and Richter), A., i, 738.
- *m*-**Xylylindigotin**, bromo-derivatives (Badische Anilin- & Soda-Fabrik), A., i, 1020.

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- **Yeast** (van Hest), A., ii, 278.
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  - poor in glycogen, preparation of (Buchner and Mitscherlich), A., ii, 834.
  - some constituents of (Hinsberg and Roos), A., ii, 760.
  - catalase from (Wender), A., i, 542 ; (Issaew), A., i, 959.
  - oxydase from (Issaew), A., i, 959.
  - behaviour of cultures of some races of, at different temperatures in reference to activity of the enzymes, length of life, resisting power, and death (Henneberg), A., ii, 634.
  - action of alkali salts on (Paulesco), A., ii, 580.
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  - influence of carbohydrates on the relations of the gas-exchange in (Kollegorsky and Zassouchine), A., ii, 68.
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  - action of sodium fluoride on (Arthus and Gavelle), A., ii, 279.
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  - dried, length of life of (Will), A., ii, 581.
  - press, detection of beer yeast in, and the introduction of a definite type of yeast in the manufacture of (Lindner), A., ii, 581.
  - top-fermentation, fermentation experiments with (Harden and Young), A., i, 543.
  - estimation of starch in (Wender), A., ii, 97.
- **Yeast extract**, detection of, in meat extract (Wintgen), A., ii, 848.
  - estimation of the xanthine bases of (Micko), A., ii, 458, 793.
- **Yeast ferments** (Shiga), A., i, 1071.
- **Yeast invertase** and **reductases.** See Invertase and Reductases.
- **Yohimbine** and its relationship to yohimboaic acid, and esters of the acid (Spiegel and Auerbach), A., i, 521.
  - two colour reactions of (Meillère), A., ii, 101.
- **Yttrium**, preparation of metallic, and its alloys (Siemens & Halske, Aktien-Gesellschaft), A., ii, 40.

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- **Zeophyllite** from Gross-Priesen, Bohemia (Pelikan), A., ii, 349.
- **Zinc**, deposition of, from zinc chloride dissolved in acetone (Patten), A., ii, 732.
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- **Zinc-ammonia** hydroxide, complex (Bonsdorff), A., ii, 733.
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commercial, estimation of silver in (Friedrich), A., ii, 843.

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Zirconium potassium fluoride, analysis of (Hall), A., ii, 825.

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Zirconium *tetra*iodide (Stähler and Denk), A., ii, 345.

sulphate, basic (Hauser), A., ii, 568.

Zirconium organic compounds (Mandl), A., i, 135.

Zirconium, Rivot's quantitative estimation of iron in presence of (Gutbier and Trenkner), A., ii, 90; (Daniel), A., ii, 149; (Gutbier), A., ii, 449.

separation of, from iron (v. Knorre), A., ii, 518.

Zymase (Bau), A., i, 464.

and alcoholic fermentation (Mazé), A., ii, 634.

isolation of, from animal and vegetable tissues (Mazé), A., i, 1072.

activity of, in dead yeast cells under varying conditions (Gromoff and Grigorieff), A., i, 960.

ERRATA.

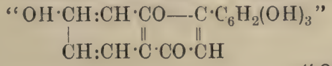
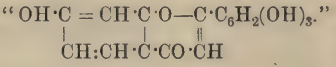
Vol. LXX (Abstr., 1896).

Part I.

Page	Line	
302	15	for "*Phenylorthohydroxybenzylcarbinol*" read "*α-Phenyl-γ-*o*-hydroxyphenylpropyl alcohol.*
302	16	,, "$OH{\cdot}C_6H_4{\cdot}CH_2{\cdot}CHPh{\cdot}OH$" *read* "$OH{\cdot}C_6H_4{\cdot}CH_2{\cdot}CH_2{\cdot}CHPh{\cdot}OH$."

Vol. LXXXII (Abstr., 1902).

Part I.

266	10, 13, 15, 16, 18, 19, 21, 26, 30, 33	*for* "glucosamine" *read* "glucamine."
266	23	for "*Benzylideneglucosamine*" read "*Benzylideneglucamine.*"
266	25	,, "*Glucosaminecarbamide*" read "*Glucaminecarbamide.*"
690	12*	,,  "$\begin{array}{l}OH{\cdot}CH{:}CH{\cdot}CO{-}C{\cdot}C_6H_2(OH)_3 \\ \quad\quad | \quad\quad\quad \| \quad\quad \| \\ \quad\quad CH{:}CH{\cdot}C{\cdot}CO{\cdot}CH\end{array}$" *read*  "$\begin{array}{l}OH{\cdot}C = CH{\cdot}C{\cdot}O{-}C{\cdot}C_6H_2(OH)_3 \\ \quad\quad | \quad\quad\quad | \quad\quad \| \\ \quad\quad CH{:}CH{\cdot}C{\cdot}CO{\cdot}CH\end{array}$."
698	26 27 15* 3*	,, "$\cdot C_{10}H_6O_2\cdot$" *read* "$\cdot C_{14}H_6O_2\cdot$."
	2*	,, "$\cdot C_{10}H_5(OH)O_2\cdot$" *read* "$\cdot C_{14}H_5(OH)O_2\cdot$."
844	19	,, "*amide*" read "*ethyl ester.*"

Part II (Index).

Page	Col.	Line	
787	i	35	*for* "glucosamine" *read* "glucamine."
866	i	5	,, "**Benzylideneglucosamine**" *read* "**Benzylideneglucamine.**"
922	i		before line 23* insert "**Glucamine** derivatives (Roux), i, 266."
922	i	7*	*delete* "derivatives (Roux), i, 266."

Collective Index, 1893—1902.

Part I.

561	ii	6*	*for* "glucosamine" *read* "glucamine."

Vol. LXXXIV (Abstr., 1903).

Part I.

Page	Line	
485	16* & 15*	*for* "phenyl *o*-phenoxybenzoate" *read* "*o*-phenoxybenzoic acid."

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* From bottom.

PART II.

Page	Line	Col.	
123	6		*for* "**Allen**" *read* "**Allan.**"
770	9	ii	
847	19	ii	
227	9		*for* "CRENDIROPOULOS" *read* "CRENDIROPOULO."
604	24–25		,, "carbon dioxide" *read* "carbon monoxide."

VOL. LXXXVI (ABSTR., 1904).

PART I.

Page	Line	
14	4	*for* "3373" *read* "3673."
84	18	,, "$C_{36}H_9Cl_6$" *read* "$C_{36}H_9Cl_9$."
276	22	,, "111" *read* "211."
315	13	,, "**Carbon Dioxide**" *read* "**Carbon Monoxide.**"
416	17	,, "6-*nitro*-3-*hydroxy*-2-*cresotic acid*" read "6-*nitro*-2-*cresotic acid.*"
504	15*	,, "$CH_2Pr^{\beta}\cdot CH_2\cdot CH_2\cdot CH(CO_2H)_2$" *read* "$CH_2Pr^{\beta}\cdot CH_2\cdot CH(CO_2H)_2$."
517	8	,, "quercitol" *read* "quercetin."
517	19*	
600	5	after "*Compt. rend.*, 1904," insert "**138.**"
620	19*	*for* "Clausen" *read* "Klauser."
631	4*	,, "3:8-Diphenyleneazone" *read* "3:8-Diaminodiphenyleneazone."
713	4	,, "3-*methyl*-4-*acetoxyethylpyrazone*-1-*carboxylamide*" read "3-*methyl*-4-*acetoxyethylpyrazolone*-1-*carboxylamide.*"
726	16	,, "2:2′:5:5′-*Tetramethylbenzene*" read "2:2′:5:5′-*Tetramethyldiphenyl.*"
740	3*	,, "$NHPh\cdot CH_2\cdot CH_2\cdot O\cdot COBz$" *read* "$NHPh\cdot CH_2\cdot CH_2\cdot OBz$."
741	11	,, "$NPhBz\cdot CH_2\cdot CH_2\cdot O\cdot COBz$" *read* "$NPhBz\cdot CH_2\cdot CH_2\cdot OBz$."
860	12*	,, "Abstr., 1895, i, 411" *read* "Abstr., 1895, i, 339."
872	17	,, "*tetrabromodinitrodiphenylmethane*" read "*tetrabromodinitrodihydroxydiphenylmethane.*"
994	4*	*after* "hipparaffin" *insert* "(3-benzoyldiaminomethane)."
1065	16 & 21	*for* "Diazo" *read* "Disazo."

PART II.

141	17*	*for* "**Nut-bearing**" *read* "**Useful.**"
165	10*	,, "**combination**" *read* "**combustion.**"
196	19*	,, "HAYASTIE" *read* "HAYASHI."
221	15*	,, "methyl cyanomethylacetoacetate" *read* "methyl cyanoacetoacetate."
221	14*	,, "methyl cyanoethylacetoacetate" *read* "methyl cyanopropionylacetate."
221	13*	,, "methyl cyanopropylacetoacetate" *read* "methyl cyano-*n*-butyrylacetate."
221	12*	,, "ethyl cyanomethylacetoacetate" *read* "ethyl cyanoacetoacetate."
221	12* & 11*	,, "ethyl cyanoethylacetoacetate" *read* "ethyl cyanopropionylacetate."

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* From bottom.

ERRATA (*continued*).

Page	Line	
221	11*	*for* "ethyl *n*-cyanopropylacetoacetate" *read* "ethyl cyano-*n*-butyrylacetate."
221	10*	,, "ethyl cyano*iso*propylacetoacetate" *read* "ethyl cyano*iso*butyrylacetate."
221	10* & 9*	,, "propyl cyanomethylacetoacetate" *read* "propyl cyanoacetoacetate."
221	9*	,, "amyl cyanomethylacetoacetate" *read* "amyl cyanoacetoacetate."
382	19	,, "formation" *read* "combustion."
383	16	,, "306°" *read* "230°."
501	17*	,, "**Amylene Chlorohydrin**" *read* "**Dimethyl*tert.*-amyl benzoate Hydrochloride.**"
550	4	,, "Kaufmann" *read* "Kauffmann."
625	11	,, "F. I. Poynton" *read* "F. J. Poynton."
630	15	,, "R. H. Elliott and W. C. Sillar" *read* "R. H. Elliot, W. C. Sillar, and George S. Carmichael."
630	23	,, "R. H. Elliott" *read* "R. H. Elliot."
631	24	,, "**Amyleine**" *read* "**Dimethylamino*tert.*-amyl benzoate.**"
742	7* 5*	,, "**Margules**" *read* "**Margueles.**"

Index.

Page	Col.	Line	
852	i	1*	*for* "273" *read* "723."
875	ii	26*	,, "**Denk,** *Benno*" read "**Denk,** *Bruno.*"
914	i	21	,, "amylene" *read* "dimethylaminotert.-amyl benzoate."
914	i	24	,, "amylene chlorohydrin" *read* "dimethylaminotert.-amyl benzoate hydrochloride."

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* From bottom.

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